Endangered Species Act - Section 7 Consultation

BIOLOGICAL OPINION

Bureau of Reclamation Operations and Maintenance of its Projects in the Snake River Basin Above Lower Granite Dam: A Supplement to the Biological Opinions Signed on March 2, 1995, and May 14, 1998

Agency: U.S. Bureau of Reclamation

Consultation Conducted By: National Marine Fisheries Service, Northwest Region

Date Issued: ________

Abbreviations and Acronyms

1995 BiOp	The Biological Opinion on operations of the FCRPS issued by NMFS on March 2, 1995
1998 BiOp	The Supplemental Biological Opinion on operations of the FCRPS issued by NMFS on May 14, 1998
427 kaf	427,000 acre-feet (the amount of water USBR provides for salmon flow augmentation from the Snake River basin)
BA	Biological Assessment
BiOp	Biological Opinion
BPA	Bonneville Power Administration
cfs	cubic feet per second
COE	U.S. Army Corps of Engineers
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Power System
IDWR	Idaho Department of Water Resources
IPC	Idaho Power Company
kaf	thousand acre-feet
kcfs	thousand cubic feet per second
lower Snake River	Mouth of Snake River upstream to Hells Canyon Dam, including four COE projects which are part of the FCRPS
Maf	million acre-feet
NMFS	National Marine Fisheries Service
NPPC	Northwest Power Planning Council
PIT-tag	Passive Integrated Transponder tag
RM	River Mile
RPA	Reasonable and Prudent Alternative
TMT	Technical Management Team
upper Snake River	The Snake River upstream of Hells Canyon Dam
USBR	U.S. Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service

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I. OBJECTIVES

This is an interagency consultation pursuant to section 7(a)(2) of the Endangered Species Act (ESA) and implementing regulations found at 50 CFR Part 402. The Bureau of Reclamation (USBR) initiated consultation with the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) to consider the effects of operating and maintaining its projects in the Snake River basin on species listed as threatened or endangered under the Endangered Species Act (ESA). [1] The NMFS is responsible for administration of the ESA for anadromous salmonids. This includes Snake River sockeye salmon (*Oncorhyncus nerka*), Snake River spring/summer and fall chinook salmon (*O. tshawytscha*), and Snake River steelhead (*O. mykiss*) as well as other ESA listed salmon and steelhead in the Columbia River basin. To determine the effects of USBR=s Snake River projects on listed salmon and steelhead, it is necessary to separate the projects into two groups: (1) those in the Snake River basin above the Idaho Power Company=s Hells Canyon Complex which are likely to significantly influence the quantity, timing, and quality of water in the Snake River but do not have salmon or steelhead within the immediate vicinity of the project, and (2) those projects in the lower Snake River Basin between Lower Granite Dam and Hells Canyon Dam which do have salmon and steelhead within the immediate vicinity of the project.

<u>Projects Upstream of Hells Canyon Complex</u>
The USBR operates and maintains 22 major storage facilities, and several smaller reservoirs and diversion works in the Snake River basin upstream of Brownlee Dam (RM 285). No ESA listed Snake River salmon or steelhead occur in the immediate vicinity of these projects, having been extirpated from the Snake River upstream of Brownlee Dam soon after it was completed in 1958. These USBR projects have a total active storage capacity of over 7 million acre-feet (Maf) and are authorized primarily for flood control, irrigation storage, and hydropower production. These projects, in conjunction with operations of the Hells Canyon Complex, alter the quantity, timing, and quality, of water passing through the lower Snake and Columbia Rivers, thereby affecting the conditions under which juvenile and adult salmonids migrate through these river reaches and under which fall chinook salmon spawn and rear downstream of Hells Canyon Dam. In accordance with NMFS= 1995 Federal Columbia River Power System (FCRPS) Biological Opinion (see Background Section), USBR has undertaken several measures to provide 427,000 acre-feet of water to the lower Snake River (from water rentals, uncontracted space, acquisition of spaceholder contracts, and natural flow rights) during periods corresponding to the migration of listed Snake River salmon and steelhead. These releases are managed to improve river conditions primarily for ESA listed Snake River fall chinook salmon smolts migrating downstream through the FCRPS. Adult sockeye salmon, summer chinook salmon, and steelhead migrating upstream through the FCRPS may also benefit from these releases.

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[1] The USFWS signed a biological opinion on October 15, 1999 covering ESA-listed species (except anadromous fish) potentially affected by the USBR=s upper Snake River projects.

While this biological opinion is supplemental to previous biological opinions, NMFS finds that a reinitiation of consultation is not warranted under the criteria of its regulations at 50 C.F.R. ' 402.16. Those regulations call for the reinitiation of previously concluded consultations when there has been excessive incidental take, when there is new information revealing greater effects, when the action changes, or if new species are listed. These conditions are not present in this consultation. The USBR does not propose to alter its operations to acquire and deliver flow augmentation water. There is no significant new information that USBR=s operations are contributing to greater effects or take than considered in the previous biological opinions. This consultation effort is not triggered by a newly listed species.

The objectives of this biological opinion for projects above the Hells Canyon Dam are:

1. to supplement the 1995 and 1998 BiOps with the details of the operation proposed and, to date implemented, to meet the 427 kaf flow augmentation requirement;
2. to evaluate the adequacy of the proposed operation to meet the 427 kaf flow augmentation requirement;
3. and to review the operation of all USBR projects in the Snake River system above Lower Granite Dam and describe factors that should be considered in future FCRPS consultations.

<u>Projects Between Lower Granite and Hells Canyon Dams</u>

In contrast, threatened Snake River steelhead are known to spawn and rear downstream from the USBR=s Lewiston Orchards project, located near the city of Lewiston in the Sweetwater Creek drainage, a tributary to Lapwai Creek on the Clearwater River. This project has about 4,370 acre-feet of active storage used primarily for irrigation. It is operationally disconnected from Reclamation projects upstream of Hells Canyon Dam.

The information necessary to fully evaluate the impact of USBR=s Lewiston Orchards project on ESA listed anadromous fish is currently being developed. After this information has been analyzed, NMFS will provide a supplemental biological opinion determining whether the continued operation and maintenance of the Lewiston Orchards project will jeopardize the continued existence of Snake River steelhead or result in the destruction or adverse modification of their proposed critical habitat.

II. EVENTS LEADING TO THIS BIOLOGICAL OPINION

Due to the status of anadromous salmonids in the Snake River basin and the recognition that hydropower and multipurpose dam development were a primary causal agent of these species= declines[2], the operating agencies of the Federal hydrosystem consulted with NMFS under section 7 of the Endangered Species Act. On March 2, 1995, NMFS issued a Biological Opinion on the Operation of the Federal Columbia River Power System (FCRPS) and Juvenile Transportation Program in 1995 and Future Years (1995 BiOp). In that opinion, NMFS determined that the operation of the FCRPS, as proposed by the U.S. Army Corps of Engineers (COE), Bonneville Power Administration (BPA), and USBR would jeopardize the continued existence of threatened and endangered Snake River spring/summer chinook, fall chinook, and sockeye and adversely modify their critical habitat.

The 1995 BiOp sets out a reasonable and prudent alternative (RPA) for the operation and configuration of the FCRPS to meet the no-jeopardy requirement of the ESA. The RPA prescribed measures to increase the interim survival of juvenile and adult salmonids and initiated the development of a long-term system configuration plan (termed the 1999 Decision). The RPA includes the following key measures: 1) using the FCRPS to increase the likelihood of meeting spring and summer seasonal flow objectives at key points within the Columbia basin, 2) spilling water to provide an alternative route of passage for smolts past mainstem dams, and 3) adding screens to reduce the number of smolts which pass the projects through turbines. A spring flow objective of 85-100 kcfs (April 10[3] through June 20), and a summer flow objective of 50-55 kcfs (June 21 through August 31) were established for Lower Granite Dam on the Snake River. A spring flow objective of 220-260 kcfs (April 20 through June 30), and a summer flow objective of 200 kcfs (June 30 through August 31) were established for McNary Dam on the Columbia River downstream from its confluence with the Snake River.

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[2] The Factors for a Decline, Supplement to the Notice of Determination of Snake River Spring/Summer Chinook Salmon Under the Endangered Species Act, NMFS, June 1991, p. 8., estimated that hydropower and multipurpose dams were responsible for about 80% of the total decline in anadromous fish runs in the basin.

[3] The 1998 BiOp subsequently changed the planning date at Lower Granite Dam from April 10 to April 3.

To help meet these flow objectives, RPA measure 1.b. directed USBR to continue to provide A427 thousand acre-feet (kaf) of flow augmentation from the upper Snake River as identified in the Power Planning Council=s Strategy for Salmon in 1995-97, taking such actions as are necessary to ensure a high probability of providing that volume by 1998", [4] and to secure additional supplies Aas may be necessary to further reduce human-caused mortality of listed salmon in the Snake River.@ This measure further specified that USBR Asecure water for flow augmentation in a manner that is consistent with applicable state law and from willing sellers.@ The RPA also included a provision that should USBR fail Ato make significant progress toward securing these volumes, formal consultation shall be initiated.@

The RPA was adopted by the COE, USBR, and BPA in their Records of Decision. Subsequently, in a November 14, 1996, letter from W. Stelle (NMFS) to B. Bohn (COE), the RPA was modified to include a framework process that reviews modifications, primarily at COE projects, not anticipated in the 1995 BiOp and examine the implications of new information and schedule modifications for successful implementation of the 1995 BiOp and the RPA. The framework process documents the adaptive management process and continues the consultation process.

On May 14, 1998, NMFS issued a supplemental Biological Opinion entitled AOperation of the Federal Columbia River Power System Including the Smolt Monitoring Program and the Juvenile Fish Transportation Program: A Supplement to the Biological Opinion Signed on March 2, 1995, For the Same Projects@ (1998 BiOp). This ESA section 7 consultation evaluated the operation of the FCRPS on newly listed threatened and endangered steelhead from the upper Columbia, lower Columbia, and Snake Rivers. In this biological opinion, NMFS determined that the operation of the FCRPS, in accordance with the RPA measures specified in the 1995 BiOp as modified in the 1998 BiOp, would not jeopardize the continued existence of threatened Snake River steelhead. The 1998 BiOp reaffirmed the need for spring flow objectives at Lower Granite Dam, screening juveniles and adults (fallbacks) from turbine entrances, and expanded the spill program at many COE mainstem projects.

Both the 1995 and 1998 BiOps clearly acknowledge that the species= biological requirements in the migratory corridor are likely to be met over the long-term only if there are major structural modifications to the FCRPS that result in significant survival improvements. The actions specified in these Biological Opinions were presented as interim measures to improve the

[4] The term Aflow augmentation@ is somewhat of a misnomer. Changes in storage and delivery patterns do not Aaugment@ or increase total annual flow. Rather they Ashape@ flow in a manner beneficial to fish. Principally, water is shaped from the winter months, when the benefits of the FCRPS to meeting regional electrical demand loads is highest, into the spring and summer to benefit juvenile outmigrants. This shaping is accomplished by two changes in operating strategy: limiting winter drawdowns to the minimum necessary to provide sufficient storage to prevent downstream flooding, and increasing summer drafts. The resulting reservoir operations are also somewhat less flexible than operations that do not consider fish impacts. For example, in a particularly good electricity market (high market value for energy), the action agencies could maximize generation revenues by further drafting FCRPS reservoirs and using the additional water to increase generation. Under these new constraints, the action agencies must consider their ability to meet future reservoir targets and flow objectives prior to taking such actions.

survival of ESA listed Snake River salmon until a regional decision could be made regarding the long-term configuration of the FCRPS. Evaluations expected to provide the necessary information for making this decision were specified. A draft Environmental Impact Statement (EIS) detailing alternative configurations and operations of the FCRPS is scheduled to be available for comment in December, 1999.

Although the 1995 and 1998 BiOps found that providing 427 kaf for flow augmentation, when combined with other measures throughout the basin, was adequate to avoid jeopardy to listed Snake River salmon, USBR, NMFS, and USFWS agreed to conduct a more detailed analysis of project operations to fully evaluate and document USBR=s ability to comply with the RPA measures, and to evaluate additional measures and impediments that could affect future efforts to avoid jeopardizing listed species and/or improve their chances for recovery.

The following summarizes selected actions concerning this consultation/conferencing process.

1. May 20, 1997. The USBR asked NMFS and USFWS to provide a listing of ESA listed, proposed, and candidate species in the project area.
2. June 16, 1997. The USBR informed irrigation water users and Indian tribes, by letter, of the decision to consult under section 7 of the ESA.
3. June 20, 1997. The NMFS and USFWS sent lists of ESA listed, proposed, and candidate species potentially found in the project area or affected by Reclamation water operations.
4. January 28, 1998. The USBR sent a draft BA to NMFS and USFWS for review.
5. March 16, 1998. The USBR reviewed comments received on draft BA and revised BA as needed.
6. April 24, 1998. The USBR sent a final BA to NMFS and USFWS.
7. August 17, 1998. The NMFS and USFWS sent a letter to Columbia River basin Indian tribes soliciting their participation in the development of this biological opinion.
8. April 8, 1999. The NMFS released a draft biological opinion for review and comment by our Federal, state, and tribal co-managers at the Implementation Team.

III. PROPOSED ACTION

The proposed action is the continuance of the current operation and routine maintenance of Bureau of Reclamation water control facilities in the Snake River basin above Lower Granite Reservoir (USBR 1998a) within the existing institutional and regulatory framework. These facilities include storage dams, reservoirs, and major diversion structures that are part of USBR projects in the Snake River basin upstream from Lower Granite Reservoir, as well as two storage facilities constructed by the U.S. Army Corps of Engineers (COE).[5] Total active storage capacity in USBR-owned or controlled facilities is about 7,166,400 acre-feet including space in Lake Lowell, an off-stream storage reservoir in the Boise Project, and the storage in two reservoirs of the Lewiston Orchards Project (Table III-1). In comparison, the average annual outflow of the Snake River is about 14 million acre-feet at Hells Canyon Dam.

This Biological Opinion covers USBR=s proposed actions at all USBR-owned or -operated facilities in the Snake River basin upstream of Lower Granite Dam (Table III-1). The duration of the proposed action is the Ainterim period@ described in the 1995 BiOp. The USBR and NMFS anticipate that this consultation will be reinitiated concurrent with a decision regarding the long-term configuration of the FCRPS projects on the lower Snake River to recover ESA listed Snake River salmon and steelhead.

All USBR projects in the Snake River basin upstream from Lower Granite Reservoir were authorized by Congress for irrigation water supply. Legislation subsequent to the 1902 and 1939 Reclamation Acts also authorizes several USBR storage facilities to be used for flood control and recreation or fish and wildlife purposes. However, supplying irrigation water remains the primary objective for USBR reservoirs. In addition, all dams must be operated in a manner that protects them from potential failure and this may require the release or routing of flows, much like formal flood control operations.

Reservoir storage can typically be considered in three parts: dead storage, inactive storage, and active storage. Dead storage is that portion of the water stored below active release mechanisms and is wholly unavailable for management. Inactive storage is that portion of storage above dead storage pool which is typically maintained to provide benefits such as powerhead or the elevation necessary to facilitate gravity diversions. Inactive storage can also be used to provide water supplies during a severe drought but the other benefits (e.g. powerhead) would be foregone.

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[5] The proposed action includes the operation of two projects constructed by COE: Lucky Peak Dam, located on the Boise River about 8 miles upstream of the city of Boise, and Ririe Dam, located on Willow Creek, a tributary which enters the Snake River near the city of Idaho Falls. These facilities are included in the proposed action because their operation is integrated with those of USBR facilities, and because USBR markets the storage in these reservoirs for irrigation water supply.

Active storage is the volume between the top of the inactive pool and the ordinary high water elevation and is the portion of reservoir that is actively managed to meet project purposes.

Table III-1. Bureau of Reclamation facilities in the Snake River basin. Source: USBR 1998a.

Name	Stream	River Mile	Active Capacity (acre-feet)[1]	Powerplant	0&M[2]
SNAKE RIVER MAIN STEM FROM HEADWATER TO HENRYS FORK					
Jackson Lake Dam	Snake R.	988.9	847,000	-	R
Palisades Dam	Snake R.	901.6	1,200,000	Reclamation	R
Henrys Fork					
Island Park Dam	Henry Fork	91.7	135,205	Non-Federal	T-F
Grassy Lake Dam	Grassy Cr.	0.5	15,200	-	T-F
Willow Creek Basin					
Ririe Dam[3]	Willow Cr.	20.5	80,500	-	R
SNAKE RIVER MAIN STEM FROM HENRYS FORK TO MILNER DAM					
American Falls Dam	Snake R.	714.0	1,672,600	Non-Federal	R
Minidoka Dam	Snake R.	674.5	95,200	Reclamation	R
BIG WOOD RIVER BASIN					
Little Wood River Dam[4]	Little Wood R.	78.8	30,000	Non-Federal	L
OWYHEE RIVER BASIN					
Owyhee Dam	Owyhee R.	28.5	715,000	Non-Federal	T-O
BOISE RIVER BASIN					
Anderson Ranch Dam	S.F. Boise R.	43.5	423,200	Reclamation	R
Arrowrock Dam	S.F. Boise R.	75.4	286,600	-	R
Lucky Peak Dam[5]	Boise R.	64.0	264,400	Non-Federal	C
Boise River Diversion Dam	Boise R.	61.4	0	Reclamation	T-B
Hubbard Lake Dam	Off-stream (Boise R.)	-	0	-	T-B
Deer Flat Dams	Off-stream (Boise R.)	-	159,400	-	T-B
MALHEUR RIVER BASIN					
Warm Springs Dam	Malheur R.	114.0	191,000	-	T-W
Agency Valley Dam	N.F. Malheur R	15.0	59,900	-	T-V
Harper Diversion Dam	Malheur R.	65.2	0	-	T-V
Bully Creek Dam	Bully Cr.	12.5	30,000	-	T-V
PAYETTE RIVER BASIN					
Cascade Dam	N.F. Payette R	38.6	653,200	Non-Federal	R
Deadwood Dam	Deadwood R.	18.0	161,900	-	R
Black Canyon Dam	Payette R.	38.7	0	Reclamation	R
WEISER RIVER BASIN					
Mann Creek Dam	Mann Cr.	13.2	10,900	-	T-M
BURNT RIVER BASIN					
Unity Dam	Burnt R.	63.6	25,000	-	T-BR
POWDER RIVER BASIN					
Mason Dam	Powder R.	122.0	90,500	-	T-BV
Thief Valley Dam	Powder R.	70.0	13,300	-	T-LP
CLEARWATER RIVER BASIN					
Reservoir A Dam	Off-stream (Sweetwater Cr.)	-	2,000	-	T-LO
Soldiers Meadow Dam	Webb Creek	. 12	2,400	-	T-LO
Lake Waha	Lake Cr. (no outlet)	-	0	-	T-LO

[1]Capacities rounded to nearest 100 acre-feet
[2]C=COE facility, Reclamation administers water service contracts for irrigation; R=Reserved facility operated and maintained by Reclamation: T=Transferred facility operated by a contracting entity, B=Boise Project Board of Control; BR=Burnt River Irrigation District BV=Baker Valley Irrigation District; F=Fremont-Madison Irrigation District; L=Little Wood River Irrigation District; LP=Lower Powder River Irrigation District; LO=Lewiston Orchards Irrigation District; M=Mann Creek Irrigation District; O=Owyhee Irrigation District; V=Vale Oregon Irrigation District; W=Warmsprings Irrigation District.
[3]Operated and maintained by Reclamation (constructed by COE).
[4]Title ownership is the Little Wood River Valley Irrigation District. [5] Reclamation administers water service contracts for irrigation.

The USBR manages the active storage capacity of its reservoirs primarily to supply irrigation water to its spaceholders. This space is termed Acontracted space.@ Uncontracted space is assigned to an array of uses such as maintenance of minimum pool levels to benefit fish, wildlife, and recreation; minimum flows downstream from the projects, and, more recently, salmon flow augmentation. In the past, uncontracted space has been used to supply water for irrigation under Aemergency contracts@ during droughts (Hydrosphere 1991). Table III-2 presents the distribution of USBR storage among these uses.

Watershed	Total USBR Storage[1]	Contracted Space	Inactive Space	Assigned Uncontracted Space	Unassigned Uncontracted Space[2]
Snake River above Milner Dam	4,326,090	4,014,795	278,400	10,000	22,896
Oregon Tributaries above Brownlee Dam	1,576,930	1,146,100	406,690	0	0
Boise and Payette River basins	1,909,100	1,150,951	119,830	502,370	135,932
Total	7,812,120	6,311,846	804,920	514,370	180,968

1 Does not include dead storage.
2 Most of this space is currently assigned to salmon flow augmentation.

Detailed descriptions of the current and historical operations of USBR projects, and scheduled maintenance activities at each of these projects, can be found in USBR=s BA (1998a) and its three accompanying documents: Operations Manual (1997a), Combined Report (1997b), and Operations Data (1998b). The Combined Report describes the operations of USBR projects on the Snake River basin upstream of Milner Dam, on the Boise and Payette River basins, and on other basins tributary to the Snake River. The Operations Manual provides information on facilities and operating considerations used to operate the river/reservoir system. The Operations Data is a compilation of historical hydrologic data from USBR=s Hydromet archive database prepared specifically for this consultation. The USBR also provided information (USBR 1998c) in response to NMFS= questions and comments (letter of March 16, 1998 from Brian Brown, Hydro Program Director, NMFS, to John Keys III, Regional Director, USBR) on USBR=s draft Biological Assessment.

The proposed action includes the annual provision of 427 kaf of water to augment flows in the lower Snake and Columbia Rivers to aid in juvenile salmon and steelhead migration. Since 1991 USBR has been delivering water for ESA-listed salmon and steelhead recovery efforts. The 1995 BiOp called on USBR to continue to provide 427 kaf of water annually for salmon flow augmentation in the lower Snake and Columbia Rivers.[6] The USBR has released flows of about this amount since 1993 (Table III-2).

[6] The NMFS is fully aware that USBR may be unable to provide 427 kaf of water annually in all years. Therefore, the 1995 BiOp only directed USBR to Atake such actions as are necessary to ensure a high probability of providing provision of that volume by 1998@ (NMFS 1995).

A. Primary Operations

As stated above, USBR projects are operated principally to store and deliver water for irrigation purposes, while protecting dam safety and providing flood control, hydropower, and other benefits where practical. In general, storage reservoir operations include the following seasonal operations:

C Non-irrigation season (approximately November - March). No releases are made for irrigation. A predetermined amount of space may be required to control winter rain-on-snow or other potential flooding events. Water may be released to achieve or maintain this required space. Storage space may also be required during this period in anticipation of spring runoff from melting snow. If so, releases are made for that purpose. Reservoirs with flood control space requirements would generally be at their lowest levels at the end of this period.

C Flood control of spring runoff, refill, and early-irrigation season (approximately April - June/July). Reservoir water surface elevations are maintained at levels that control runoff with releases dependent on the forecast runoff volume and timing. Reservoirs are filled as the runoff diminishes and generally reach their highest water surface elevations in June or early July.

C Drawdown season (approximately mid-June - October). Irrigation storage drawdown season begins when natural flow is insufficient to meet irrigation demand (typically mid-June to mid-July). Release from storage (drafting) is required to meet the demands.

Irrigation deliveries are made in accordance with state law regarding the allocation of water resources. The USBR has entered into spaceholder contracts with water user entities including irrigation districts and canal companies for the active storage space within its projects. Such contracts typically are in effect for the life of the project. Spaceholders pay the construction, operation, and maintenance costs associated with that space. During the irrigation season, each spaceholder informs the watermaster (a state employee charged with administering water rights) of how much water is needed. These requests are totaled by the watermaster, who then requests USBR to release that amount of water. The watermaster tracks the amount of water in each spaceholder=s account. A spaceholder cannot store or release more water than accrues to its contracted space.

Idaho=s water law allows the operation of rental pools. Spaceholders with excess water for that year=s need can assign water to the rental pool where it can be sold to others. Rental pools are the source of a major portion of the water released for salmon flow augmentation by USBR.

B. Incidental Operations

Operations for functions other than irrigation and flood control are termed incidental because water is not specifically released for those functions. For instance, authorization for hydropower allows a Federal powerplant to be constructed. Water otherwise being released for irrigation or flood control is then used to generate power. In a few cases, there are specific requirements related to fish and wildlife propagation and water quality, but there are none related to water control for recreation. The USBR attempts to accommodate public concerns within the existing legal requirements of project authorization, state and Federal law, and spaceholder contracts.

Salmon Flow Augmentation

Release of 427 kaf of water by USBR above that required to meet irrigation demand in the Snake River basin, and delivery of this water to Lower Granite Reservoir, is a primary feature of the flow augmentation program included in the 1995 BiOp=s RPA to protect Snake River chinook and sockeye salmon. The 1998 BiOp determined that the spring flow objective was also adequate, in combination with other requirements in the RPA for the FCRPS, to avoid jeopardizing the continued existence of Snake River steelhead (NMFS 1998).

The USBR annually attempts to provide 427 kaf through the use of natural flow rights, uncontracted space, reacquired spaceholder contracts, and water rentals (Table III-2). The USBR complies with all applicable Idaho, Oregon, and Wyoming laws as well as various policies and institutional practices in delivering salmon flow augmentation water. To facilitate these deliveries, legislation was enacted by the State of Idaho (Idaho Code, Chapter 17, Section 42-1763B). Key provisions of that legislation state that:

- Water is to be obtained only from willing lessors;
- Water must be obtained from storage;
- Water releases must be used for power generation in Idaho;
- The maximum amount of stored water to be used for salmon flow augmentation is 427,000 acre-feet, which is to be reduced by any other water USBR provides from elsewhere in the Snake River or its tributaries;
- Limits drafts to maintain at least 300,000 at Cascade Reservoir on the Payette River; and
- Authority expires on January 1, 2000.

Table III- 3. Water provided by USBR for salmon flow augmentation in acre-feet. Source: USBR 1998a.

Item	1991	1992	1993	1994	1995	1996	1997	1998[1]
Upper Snake River								
USBR space	15,000		206,617	285,954	22,396	22,396	22,396	22,876
Rentals	84,000		65,000	44,325	232,839	194,667	202,104	202,326
Subtotal	99,000		271,617	330,279	255,235	217,063	224,500	225,202

Payette River								
USBR space	28,874	90,000	95,000	61,883	94,242	95,000	95,000	95,000
Rentals	73,651		34,971		50,758	56,300	60,000	50,044
Subtotal	102,525		129,971	61,883	145,000	151,300	155,000	145,044
Boise River								
USBR space			23,000	35,950	25,000	38,000	38,000	40,932
Rentals					2,000		2,000	0
Subtotal			23,000	35,950	27,000	38,000	40,000	40,932
Oregon Natural Flows								
Skyline						15,714	17,649	17,649
Water Trust						64	132	198
Subtotal						15,778	17,781	17,847
Total	**201,525**	**90,000**	**424,588**	**428,112**	**427,235**	**422,141**	**437,281**	**429,045**
USBR space	43,874	90,000	324,617	383,787	141,638	155,396	155,396	158,828
Rentals	157,651	0	99,971	44,325	285,597	250,967	264,104	250,325
Natural flow	0	0	0	0	0	15,778	17,781	17,847

1 Source: BPA 1998.

C. Annual Planning for Supplying Salmon Flow Augmentation

USBR annually goes through a process of several steps to set up deliveries for flow augmentation. An annual plan for acquisition and delivery of water is prepared for the Technical Management Team (TMT). The TMT was established under the 1995 BiOp for the purpose of managing available water resources to benefit salmon and is open to representatives of Federal agencies (USBR, COE, BPA, NMFS, USFWS, and EPA), the states (Idaho, Oregon, Washington, Montana, and Alaska), the Northwest Power Planning Council (NPPC), and Columbia River basin treaty tribes. The TMT is responsible for making recommendations to USBR and COE on dam and reservoir operations; including delivery and shaping of water to augment flows, juvenile fish transportation operations, and spill at mainstem dams to optimize passage conditions for juvenile and adult anadromous fish. The USBR=s annual efforts include quantifying the amount of water available, planning the releases, providing a plan to the TMT, and implementing the releases.

<u>Quantifying Available Natural Flows</u>

USBR has permanently acquired 17,650 acre-feet of natural flow rights[7] in Oregon (Skyline Farms). Oregon water law permits the acquisition of natural flow water rights for instream use. The USBR annually works with the Oregon Water Resources Department (OWRD) to confirm the amount and timing of acquired water rights. These arrangements need to be completed in advance of each year=s summer flow augmentation season.

Quantifying Water Available in Uncontracted Space

Currently, uncontracted space is formally assigned to a variety of purposes including environmental mitigation, conservation pools, reservoir evaporation, streamflow maintenance, and salmon flow augmentation. The USBR is also actively reacquiring reservoir space for salmon flow augmentation. As of 1998, reacquired space in the reservoirs upstream of Milner Dam totaled 22,896 acre-feet. In the Boise River basin, 37,378 acre-feet of space have been reacquired for salmon flows and 3,554 acre-feet of uncontracted storage has been assigned to flow augmentation for a total of 40,932 acre-feet. In the Payette River basin, there are 95,000 acre-feet of uncontracted space assigned to salmon flow augmentation. The USBR has assigned this reacquired and uncontracted space for flow augmentation for as long as it is needed for ESA listed anadromous fish runs. The USBR proposes to continue seeking opportunities to acquire additional water for this purpose. The USBR works with the watermasters of those basins to determine the amount of water accrued in that space and to release this water for flow augmentation.

Multi-year Rental Agreement with Shoshone-Bannock Tribes

In September 1998, USBR entered into a 5-year agreement with the Shoshone-Bannock Tribal Water Bank for the control and use of 38,000 acre-feet of the tribe=s entitlement in American Falls Reservoir. This space is dedicated to salmon flow augmentation and water for that purpose will be available annually, starting in 1999. Under this agreement the tribe may make additional American Falls Reservoir water available for rental at $9.00 per acre-foot. This agreement expires on December 31, 2003.

Quantifying Water from Rental Pools and Arranging Delivery

After quantifying the amount of USBR water available from natural flows and uncontracted space, USBR attempts to purchase the remaining water from rental pools to make up the 427 kaf. After determining the total rental need, USBR makes requests for rental water through the watermaster of each rental pool. The USBR to date has based its distribution between the three pools on the cost of rentals. Rental costs in 1997 were $5.40 per acre-foot for Payette rentals, $6.50 per acre-foot for Boise rentals, and $10.50 per-acre foot for upper Snake rentals.

Powerhead Space

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[7] Natural flow rights are water rights to the native flows in a watercourse without diminution or augmentation due to water storage.

Powerhead space is part of the inactive capacity of a reservoir intended to provide the hydraulic head (difference between reservoir water surface elevation and tailwater elevation) needed for generation of hydroelectric power. Without sufficient hydraulic head, generating units will not operate properly and must be shut down. USBR proposes to release powerhead space in the event that the 427 kaf cannot be acquired by other means. Prior to the 1995 BiOp, drought conditions severely reduced the availability of rental water. In 1992, there was no rental water available for flow augmentation, and in 1993 and 1994, insufficient volumes of water were made available for rental by water users. The USBR used never-before-released powerhead space as a last resort in 1993 and 1994. More favorable weather conditions in 1995 increased rentals and filled USBR space.

D. Basin Specific Operations to Provide 427 kaf of Augmentation Water

The primary purpose of flow augmentation is to provide flows for juvenile salmonids migrating between April 3 and August 31. The USBR generally assumes the 427 kaf will be needed in the latter part of the migration in July and August. This coincides with the recession of natural flows and the beginning of storage draft for irrigation. Storage releases for irrigation generally begin by mid-July, but may begin as early as April or May in a low water year. Typically, salmon flow augmentation water is not released while natural flows are sufficient to meet the flow objectives. However, the strategy for release depends on the magnitude and timing of the natural runoff and the timing and numbers of migrating fish.

<u>Payette River Releases</u>

In the recent good water years, about 150,000 acre-feet of salmon flow augmentation water have been released from the Payette River basin. The Payette River Watershed Council meets on a regular basis to discuss a variety of operational issues including salmon flow augmentation. The USBR participates in these meetings and attempts to develop consensus on a flow release plan. A general strategy has evolved since USBR first released water for flow augmentation in 1991. The watershed council participants have generally agreed on a plan that releases some of the water in the summer and some of the water in the winter. Releasing water in the summer benefits white water recreation, water quality in the lower Payette River, and resident stream fish whereas releasing water in the winter benefits summertime lake recreation, water quality, and resident fish populations in the river and in Cascade and Deadwood Reservoirs. The split has been 50/50 and 60/40 for summer/winter releases. This release pattern is feasible because IPC (a watershed council participant) has agreed to pre-deliver Payette River water by drafting Brownlee storage to meet salmon flows in anticipation of subsequent Payette basin releases.

Summer releases from the Payette are usually made at a rate of about 1,000 cfs above irrigation deliveries until sometime in August. Although this modest rate lengthens the delivery time, it avoids damage to gravel push-up diversion dams and the need to rebuild those diversion structures when the augmentation releases end. The Payette winter release generally begins in early to mid-December to repay IPC for the summer Brownlee release. IPC indicates that this strategy is acceptable for power production and helps create space in Brownlee Reservoir to better manage flows downstream of Hells Canyon Dam during the fall chinook spawning season, mid-October to early December.

Boise River Releases

The volume released from the Boise River reservoirs has been about 38,000 acre-feet in recent good water years. The USBR typically requests that releases for flow augmentation begin when storage releases for irrigation begin. The release rate is relatively low, about 400 cfs above the irrigation release rate due to recreation safety concerns and to avoid damage to gravel push-up dams. Floating the Boise River from Barber Dam to the Boise city center is a popular summertime recreational activity attracting thousands of participants. The maximum flow considered safe by the Ada County Parks and Waterways is 1,500 cfs; irrigation releases are usually about 1,100 cfs. Temporary gravel push-up dams are needed to divert water from the river at flows below 1,250 cfs and can be damaged at flows above 1,500 cfs, thus limiting the flow augmentation rate.

Upper Snake River Releases

Since 1993 USBR has released between 217,000 and 330,000 acre-feet of water from the upper Snake River reservoirs for salmon flow augmentation. In 1994 250,000 acre-feet were taken from powerhead space to provide the full amount of salmon flow augmentation water. The USBR typically begins releasing this water when natural flows at Milner Dam fall below 1,500 cfs, normally in late June or early July. A flow of 1,500 cfs is maintained through the remainder of the summer until all of the upper Snake River flow augmentation water has been released.

The USBR, USFWS, and IPC are parties to the AMilner Agreement@ which limits the release of salmon flow augmentation water to 1,500 cfs below Milner Dam. Limiting flows below Milner to 1,500 cfs minimizes spill at IPC powerplants between Milner and Brownlee thereby improving power generation. By prolonging the release this agreement also provides instream benefits for water quality and resident fish and wildlife in the middle Snake River. Through this agreement (and separate ESA consultations) USBR operates to reduce flows (ramp down) in a manner that will reduce the possibility of stranding ESA listed snail species. A maximum reduction rate of 100 cfs per day is currently used. This agreement will expire after 1999.

BPA/IPC Agreement

Limiting flows at Milner Dam to 1500 cfs prevents a portion of the USBR releases from reaching Brownlee Reservoir before the end of the summer flow augmentation period (August 31). To facilitate better timing of the deliveries of water released by USBR for its salmon flow augmentation program, BPA has entered into an energy exchange agreement with IPC. Under this agreement IPC passes water it receives from USBR storage during the outmigration season through the Hells Canyon Complex and pre-releases water during the outmigration season in anticipation of subsequent deliveries of USBR water. By shaping discharge into July and August, these operations affect the timing of generation. They also reduce the amount of water stored in Brownlee Reservoir, thereby reducing the powerhead and the amount of energy generated for each unit of water passed through the turbines. IPC is compensated for its participation by energy deliveries from BPA between October 1 and April 15 each year for losses incurred during the outmigration season.

E. Delivery of Water

Coordination with TMT

The USBR provides a Snake River flow augmentation plan to the TMT as soon as preliminary coordination has been conducted with the entities involved in the supply and delivery of the 427 kaf. This plan is usually available to the TMT by mid-April. The USBR monitors streamflow and reservoir conditions above Brownlee and begins delivery in accordance with the augmentation plans and in consideration of recommendations of the TMT. When USBR deliveries begin, the flows essentially become part of the Brownlee inflow and the TMT can schedule release of the USBR flow augmentation water by weekly requests for releases from Brownlee Dam.

Use of Water and Space in the Event of Water Shortages

It is not possible for USBR to ensure delivery of the entire 427 kaf of salmon flow augmentation water in all years. This is due to both the natural variability in annual streamflow and legal and institutional constraints on project operations. These constraints include the fact that USBR has perpetually contracted out most of the active storage space in its reservoirs**.** There are also constraints inherent in Idaho=s water rental pools. These and other constraints are discussed in Section VI, B of this Biological Opinion.

In the event that USBR cannot meet its obligation to provide at least 427 kaf of salmon flow augmentation water through deliveries of water from uncontracted storage, natural flow rights, or Idaho=s water rental pools, USBR would draft additional water from the powerhead space in its reservoirs. Use of water from powerhead space is a measure of last resort and would be considered only when water available from other sources will provide less than the 427 kaf. The USBR has estimated that even considering the use of powerhead space, it would not be possible to deliver 427 kaf in consecutive low water years.

The USBR is continuing efforts to provide a firm water supply for flow augmentation through its water acquisition program, and will continue to solicit water users to contribute to rental pools and purchase water as needed. At this time, USBR has reacquired 63,828 acre-feet of space in the Boise basin and Snake River above Milner Dam and have assigned 95,000 acre-feet of previously uncontracted space in the Payette basin to salmon flow augmentation for a total of 158,828 acre-feet. The USBR has also acquired 17,650 acre-feet of natural flow rights in Oregon for this program. This amounts to 41 percent of the 427 kaf in years of good water supply when the storage space fills. The remainder is provided through rental pool purchases. Without adequate consignments to the rental pools, USBR would use water from powerhead space.

F. USBR=s Long-Term Planning Efforts

USBR=s Snake River Resources Review SR^3

The primary emphasis of USBR=s projects to date has been to provide water for agricultural operations. In an effort to address the diverse expectations of Idaho=s growing population, USBR initiated the Snake River Resources Review (SR^3) process. The goal of SR^3 is to develop a decisions support system, including an information network and public outreach, that will enhance, refine, and improve the ability to make sound resource decisions related to the operation and management of the Snake River system. Once developed, this information will improve USBR=s ability to analyze operations for traditional uses such as irrigation, flood control and power generation, while considering other requests. Other requests include releasing water for recovery of endangered salmon in the lower Snake and Columbia Rivers, protecting in-basin ESA listed species, recharging aquifers, providing water for municipal and industrial use, improving water quality, improving recreation opportunities, protecting cultural resources and Indian trust assets, and protecting and enhancing fish and wildlife habitat.

USBR=s One Million Acre Feet Analysis

The USBR recently (1999b) completed the ASnake River Flow Augmentation Impact Analysis Appendix@ referred to here as the One Million Acre-Feet Analysis (1 Maf Analysis). This analysis was prepared in conjunction with the COE=s Lower Snake River Juvenile Salmon Migration Feasibility Study. The analysis is an attempt to assess the potential effects on the Snake River basin upstream of Lower Granite Dam if an additional one Maf were reallocated to salmon flow augmentation. While neither the results of the SR^3 nor the 1 Maf Analysis are the subject of this consultation, they are representative of the fact that additional changes in water management are being considered for the year 2000 and beyond.

IV. BIOLOGICAL INFORMATION

A. ESA Listed Salmon and Steelhead in the Snake River Basin

Three anadromous salmonid species, represented by four distinct evolutionarily significant units (ESU=s), are currently protected under the Endangered Species Act in the Snake River basin. Snake River sockeye were listed as endangered on November 20, 1991 [56 FR 58619], Snake River spring/summer and Snake River fall chinook salmon were listed as threatened on April 22, 1992 [57 FR 14653]), and Snake River steelhead were listed as threatened on August 18, 1997 [62 FR 43937]. Snake River coho salmon have been considered extinct since 1986, the year in which the last adult native coho salmon passed Lower Granite Dam (COE 1997).

The biological requirements, life histories, migration timing, historic abundance, and factors contributing to the decline of Snake River salmon and steelhead have been well documented (NMFS 1995a, NMFS 1995b, Busby et al. 1996, Myers et al. 1998, NMFS 1998, and USBR 1998). The geographic range of steelhead, spring/summer chinook and fall salmon has been significantly reduced by the construction of Swan Falls Dam (RM 458) in 1901 and Brownlee Dam (RM 285) in 1958 on the mainstem Snake River. Hells Canyon Dam (RM 247) was completed in 1967 and is the current uppermost point of migration for anadromous fish.

The NMFS designated critical habitat for Snake River sockeye, spring/summer chinook, and fall chinook salmon on December 28, 1993 [58 FR 68543]. Critical habitat for Snake River steelhead was proposed on February 5, 1999 [64 CFR 5740]. At present, critical habitat for listed Snake River salmon or steelhead does not include areas upstream of Hells Canyon Dam on the Snake River or Dworshak Dam on the North Fork Clearwater River.

Based on similarities in genetics, life history, and ocean recoveries of coded wire tags, on March 9, 1998, NMFS proposed that the Snake River fall chinook salmon ESU be redefined to include the fall chinook salmon population in the Deschutes River in Oregon [63 FR 11482]. The NMFS extended the deadline for a final determination regarding this fall chinook ESU to September 9, 1999 [64 FR 14329] so that additional information on these two populations could be collected and analyzed. The NMFS issued a final rule on September 16, 1999 [64 FR 50394] determining that the Deschutes River population is a distinct ESU, and should not be considered as part of either the Snake River or Upper Columbia River ESUs.

1. Snake River Steelhead

Historically, Snake River steelhead spawned in virtually all accessible habitat in the Snake River up to Shoshone Falls. The development of irrigation and hydropower projects on the mainstem Snake River have significantly reduced the amount of available habitat for this species (see discussion above). No valid historical estimates of adult steelhead returning to the Snake River basin prior to the completion of Ice Harbor Dam in 1962 are available. However, Snake River steelhead sportfishing catches ranged from 20,000 to 55,000 fish during the 1960s (Fulton 1970). The run of steelhead was likely several times as large as the sportfish take. Between 1949 and 1971, adult steelhead counts at Lewiston Dam (on the Clearwater River) averaged about 40,000 per year. The count at Ice Harbor Dam in 1962 was 108,000 and averaged approximately 70,000 per year between 1963 and 1970.

The most recent 5-year geometric mean (1990-1994) for escapement above Lower Granite Dam was approximately 71,000. However, the wild component of this run was only 9,400 adults (7,000 A-run and 2,400 B-run). In recent years average densities of wild juvenile steelhead have decreased significantly for both A-run and B-run steelhead. Many basins within the Snake River are significantly underseeded relative to their carrying capacities (Busby, et al. 1996).

O. mykiss populations exhibit a complex suite of life history traits. They exist in both anadromous (steelhead) and freshwater resident (rainbow or red-band trout) forms. Unlike other Pacific salmon species, steelhead are capable of spawning more than once, returning to the ocean to feed between spawning events. Snake River basin steelhead rarely return to spawn a second time. Steelhead can be classified into two reproductive types: stream-maturing steelhead, which enter fresh water in a sexually immature condition and wait several months before spawning, and ocean-maturing steelhead, which return to freshwater with fully developed gonads and spawn shortly thereafter. In the Pacific Northwest, stream-maturing steelhead enter fresh water between May and October and are referred to as Asummer@ steelhead. In comparison, ocean-maturing steelhead return between November and April and are considered Awinter@ steelhead. Inland steelhead populations in the Columbia River basin are almost exclusively of the summer variety (Busby, et al. 1996).

Snake River steelhead can be further divided into two groupings: A-run steelhead and B-run steelhead. This dichotomy reflects the bimodal migration of adult steelhead observed at Bonneville Dam. A-run steelhead generally return to fresh water between June and August after spending one year in the ocean. These fish are typically less than 77.5 cm in length. B-run steelhead usually return to fresh water from late August to October after spending two years in the ocean and are generally greater than 77.5 cm in length. The NMFS, in consultation with the Technical Advisory Committee, has concluded that it is Aappropriate to manage separately for the two components [of the Snake River steelhead ESU] using fish length as the primary criterion@ (NMFS 1999). Both A-run and B-run spawn the following spring from March to May in small to mid-sized streams. The fry emerge in 7 to 10 weeks, depending on temperature, and usually spend 2 or 3 years in fresh water before migrating to the ocean from April to mid-June. It is important to note that these estimates are based on population averages and that steelhead are capable of remarkable plasticity with respect to their life cycles. Some juveniles have been documented as spending up to 7 years rearing in fresh water, and adults may spend up to 3 years in salt water before returning to spawn (Busby, et al. 1996).

2. Snake River Sockeye

Prior to the turn of the century (c. 1880) around 150,000 sockeye salmon ascended the Wallowa, Payette, and Salmon River basins to spawn in natural lakes (Evermann 1896). Sockeye populations in the Payette basin lakes were eliminated after a diversion dam near Horseshoe Bend was constructed in 1914, and Black Canyon Dam was completed in 1924. In 1916, a dam at Wallowa Lake was increased in height, resulting in the extinction of indigenous sockeye in

Wallowa Lake (Gustafson 1997). Sockeye salmon in the Salmon River occurred historically in at least four lakes within Idaho=s Stanley basin: Alturas, Redfish, Pettit, and Stanley Lakes. Sunbeam Dam, located 20 miles downstream from Redfish Lake, severely limited sockeye and other anadromous salmonid production in the upper Salmon River between 1910 to 1934 (Waples et al. 1991a). In the 1950s and 1960s, more than 4,000 adults returned annually to Redfish Lake. Between 1985 and 1987, an average of 13 sockeye were counted at the Redfish Lake weir (USBR 1998). Only ten sockeye have returned to Redfish Lake since 1994: one in 1994, another in 1996, another 1998, and seven in 1999. Since 1991, adult sockeye returning to Redfish Lake have been captured to support a captive broodstock program.

Snake River sockeye salmon adults enter the Columbia River in June and July, migrate upstream through the Snake and Salmon Rivers, and arrive at Redfish Lake in August. Spawning peaks in October and occurs in the lakeshore gravels. Fry emerge in late April and May and move immediately to the open waters of the lake where they feed on plankton for one to three years before migrating to the ocean. Juvenile sockeye generally leave Redfish Lake from late April through May and migrate nearly 900 miles to the Pacific Ocean. Passage of smolts at Lower Granite Dam ranges from late April to July, but usually peaks sometime in May or June. Snake River sockeye spend two to three years in the Pacific Ocean before returning to their natal lake to spawn.

3. Snake River Spring/Summer Chinook

It is estimated that at least 1.5 million spring/summer chinook salmon returned to the Snake River in the late 1800's, approximately 39 to 44 percent of all spring/summer chinook in the Columbia River basin. Historically, Shoshone Falls (RM 615) was the uppermost limit to spring/summer chinook migration, and spawning occurred in virtually all suitable and accessible habitat in the Snake River basin (Matthews and Waples 1991). The development of mainstem irrigation and hydroelectric projects in the mainstem Snake River basin has significantly reduced the amount of habitat available for spring/summer chinook (see discussion in A. above).

The mainstem Columbia and Snake River hydropower projects, built between 1938 (Bonneville Dam) and 1975 (Lower Granite Dam), contributed significantly to the decline of Snake River salmon (NMFS 1995). Between 1950 and 1960, an average of 125,000 adults returned to the Snake River, only 8 percent of historical estimates. An estimated average of 100,000 wild adults would have returned from 1964 to 1968 after adjusting for fish harvested in the river fisheries below McNary Dam. However, actual counts of wild adults at Ice Harbor Dam annually averaged only 59,000 each year from 1962 to 1970. The estimated number of wild adult chinook salmon passing Lower Granite Dam between 1980 and 1990 was 9,674 fish (Matthews and Waples 1991). The most recent 5-year geometric mean (1992-1996) was only 3,820 naturally produced spawners (Myers et al. 1998). This is less than 0.3% of the estimated historical abundance of wild Snake River spring/summer chinook.

Snake River spring/summer chinook migrate through the Columbia River from March through July (Matthews and Waples 1991), and spawn in smaller, higher elevation streams than do fall chinook. Fry generally emerge from the gravel between February and June. Snake River spring/summer chinook exhibit a Astream@ type juvenile life history pattern, rearing for one, or sometimes even two years in freshwater before migrating to the ocean from April through June. These smolts are often referred to Ayearling@ chinook. Adults typically remain in the ocean for two or three years before returning to spawn.

4. Snake River Fall Chinook

Snake River fall chinook once spawned from the Snake River=s confluence with the Columbia River upstream to Shoshone Falls (RM 615). The spawning grounds between Huntington (RM 328) and Auger Falls (RM 607) were historically the most important for this species. Only limited spawning activity was reported downstream from RM 273 (Waples, et al. 1991), about one mile upstream of Oxbow Dam. Since then, irrigation and hydropower projects on the mainstem Snake River have blocked access or inundated this habitat upstream of Hells Canyon Dam (RM 247).

No reliable estimates of historical abundance are available, but because of their dependence on mainstem habitat for spawning, fall chinook have probably been impacted to a greater extent by the development of irrigation and hydroelectric projects than any other species of salmon. It has been estimated that the mean number of adult Snake River fall chinook salmon declined from 72,000 in the 1930s and 1940s to 29,000 during the 1950s. In spite of this, the Snake River remained the most important natural production area for fall chinook in the entire Columbia River basin through the 1950s. The number of adults counted at the uppermost Snake River mainstem dams averaged 12,720 total spawners from 1964 to 1968, 3,416 spawners from 1969 to 1974, and 610 spawners from 1975 to 1980 (Waples, et al. 1991b).

Counts of adult fish of natural origin continued to decline through the 1980s reaching a low of 78 individuals in 1990. Myers et al. (1998) estimated the 5-year (1992 - 1996) geometric mean of adult spawners returning to Lower Granite Dam at 1,020 adults per year (514 of natural origin). The estimated number of natural spawners reaching Lower Granite Dam in 1997 and 1998 was 797 and 306 respectively (TAC 1998 and Bayley 1999). To ensure persistence into the future, at least 300 adult spawners must reach their spawning grounds in the Snake River upstream of Lower Granite Reservoir. To achieve this goal, NMFS (1995a) estimated that at least 519 natural adult spawners would need to pass Lower Granite Dam. The recovery standard identified in the 1995 BiOp for Snake River fall chinook was a population of at least 2,500 naturally produced spawners in the lower Snake River and its tributaries (or 4,325 natural adults past Lower Granite Dam). While the recent upward trend is somewhat encouraging, it should be regarded with caution.

Snake River fall chinook migrate up the Columbia and Snake Rivers from August through October. Spawning occurs in the mainstem Snake River and in the lower parts of its major tributaries in October and November. At present, the fry emerge from the spawning beds from late March through early June (Rondorf and Tiffan 1994). Snake River fall chinook exhibit an Aocean@ type juvenile life history pattern, usually rearing in freshwater for only a few months before migrating to the ocean. For this reason fall chinook smolts are sometimes referred to as Asubyearling@ chinook. Currently, the peak of the smolt outmigration usually occurs in July, however juvenile fall chinook may be found migrating from May through October. The nearshore areas of the Snake and Columbia Rivers are important foraging environments for fall chinook smolts as they migrate. Adults usually return to the Snake River after three years at sea (Waples et al., 1991b).

B. Other ESA Listed and Proposed Columbia Basin Salmon and Steelhead

In addition to Snake River salmon and steelhead, several other salmon stocks in the Columbia River basin have been listed, or are proposed for listing under the ESA. Because salmon flow augmentation water is used to meet flow objectives at McNary Dam on the mainstem Columbia River as well as at Lower Granite Dam, and river flows directly affect the Columbia River estuary and plume, it is appropriate to consider these species as well.

1. Steelhead

The NMFS listed Upper Columbia River steelhead as endangered on August 18, 1997 (FR 62 43937). On March 19, 1998 steelhead in the Lower Columbia River ESU were listed as threatened (FR 63 13347). Finally, on March 25, 1999, NMFS listed Middle Columbia River steelhead and Upper Willamette River steelhead as threatened (FR 64 14517).

2. Chinook Salmon

The NMFS listed Upper Columbia River spring chinook as endangered, and Lower Columbia River fall chinook and Upper Willamette River spring chinook as threatened on March 24, 1999 (FR 64 14308).

3. Chum Salmon

Lower Columbia River chum salmon were listed as threatened on March 25, 1999 (FR 64 14508).

V. ENVIRONMENTAL BASELINE

1. Status of the Species Within the Action Area

The status of ESA listed Snake River salmon and steelhead is such that their long-term survival will require a significant improvement in the environmental conditions of their critical habitat (over those currently available under the environmental baseline). Maintenance or further degradation of these conditions would not reverse the declining trend and would thus continue to increase the amount of risk from adverse effects that listed salmon face under the environmental baseline.

At the species level, the biological requirements of Snake River salmon and steelhead are the population numbers, trends, geographic distribution, and genetic variability that are sufficient to ensure survival with an adequate potential for recovery. The biological requirements of Snake River salmon and steelhead are currently not being met under the environmental baseline, which is apparent from the species= declining status in recent years (NMFS 1995 and NMFS 1998).

1. Biological Requirements for the Listed Species

The biological requirements of Pacific salmon and steelhead can be described in terms of four components: (1) spawning and juvenile rearing areas, (2) juvenile migration corridors, (3) areas for growth and development to adulthood, and (4) adult migration corridors. No ESA listed Snake River sockeye, spring/summer chinook, fall chinook or steelhead are found in the immediate vicinity of USBR facilities upstream of Hells Canyon Dam[8]. However, the operation of these projects affects the quantity, timing (hydrograph), and quality of water in the lower Snake and Columbia Rivers (NMFS 1995, NMFS 1998a, and USBR 1998c) where salmon and steelhead spawn, rear, and migrate.

a. Juvenile and Adult Migration Corridor

The action area relative to both juvenile and adult Snake River steelhead, sockeye salmon, spring/summer chinook salmon, and fall chinook salmon can be described as that part of the migration corridor which is affected by the operation of USBR projects. This area is best defined as the farthest upstream point at which smolts enter (or adults exit) the Snake River to the farthest downstream point at which they exit (or adults enter) the migration corridor. Geographically, this translates to the Snake River immediately below Hells Canyon Dam (or the point at which tributary streams meet the Snake River) downstream to the Columbia River plume in the Pacific Ocean and the near-shore ocean environment.

[8] Hells Canyon Dam (RM 247) is the current upper limit to salmon migration on the mainstem Snake River. Historically, spring/summer chinook, fall chinook, and steelhead spawned in virtually all accessible and suitable habitat in the Snake River upstream to Shoshone Falls (RM 615).

The essential features of the juvenile and adult migration corridor are described in the critical habitat designation for Snake River spring/summer chinook salmon, fall chinook salmon, and sockeye salmon [58 FR 68543]. For juveniles, they include adequate substrate, water quality, water quantity, water temperature, water velocity, cover and shelter, food, riparian vegetation, space, and conditions for safe passage. Adults of these species in the migration corridor share these essential needs with the exception of adequate food. Because juvenile fall chinook feed and rear as they migrate downstream more than any other anadromous species, they are especially dependent upon the nearshore areas within the juvenile migration corridor.

b. Spawning and Juvenile Rearing Areas for Fall Chinook

The action area relative to Snake River fall chinook also includes critical spawning and rearing habitat in the mainstem Snake River from Hells Canyon Dam (RM 237) to the Columbia River estuary. Essential features of spawning and rearing habitat include adequate spawning gravel, water quality, water quantity, water temperature, cover and shelter, food, riparian vegetation, and space.

B. Factors Affecting the Species= Environment Within the Action Area

1. Geographic Baseline

The Snake River basin upstream of Lower Granite Reservoir encompasses 103,200 square miles in the states of Idaho, Oregon, Nevada, Washington, and Wyoming. Historically, the Snake River basin upstream from the current location of Lower Granite Reservoir was an important watershed for anadromous salmonids (see Section IV). Much of the historical ranges of these fish has been degraded, cut off, or both by dams and diversions. In particular, the Hells Canyon Complex excluded anadromous salmonids from hundreds of miles of habitat in the Snake, Boise, and Payette Rivers and other tributaries. Dworshak Dam on the North Fork Clearwater River also reduced the range of these fish in the basin. As noted in section IV however, the status of the affected salmon populations was already heavily influenced by development.

2. Hydrologic Baseline

This Biological Opinion covers the operation of all water storage and delivery projects where USBR retains an operational or administrative presence in the Snake River basin upstream of Lower Granite Reservoir. The backwaters of Lower Granite Reservoir reach the confluence of the Snake and Clearwater Rivers at river mile (RM) 139.3 near Lewiston, Idaho. Lower Granite Dam, operated by the COE, is located at RM 107.5 of the Snake River. All USBR projects upstream of Lower Granite Reservoir, except for one small irrigation project, are located upstream of Brownlee Dam (RM 287.4) which is operated by the Idaho Power Company (IPC).

The Snake River basin encompasses about 87 percent of the State of Idaho. The Snake River flows south from its headwaters in Yellowstone National Park, Wyoming, turns west to the Idaho border, and flows northwest to the confluence with the Henrys Fork. From that point, the river follows a southerly crescent across Idaho to the Idaho-Oregon border and then turns north forming the Idaho-Oregon border. Various tributaries along the Idaho-Oregon border reach include the Boise, Payette, and Weiser Rivers in Idaho and the Owyhee, Malheur, Burnt, and

Powder Rivers in Oregon. The upper limit of Brownlee Reservoir is near RM 340. Brownlee Dam, along with Oxbow Dam and Hells Canyon Dam, comprise what is commonly referred to as the Hells Canyon Complex, owned and operated by the IPC. The Snake River continues northward and forms a section of the Idaho-Washington border before finally turning west at Lewiston, Idaho.

The Snake River basin upstream of Brownlee Dam drains about 72,590 square miles. There are 31 dams and reservoirs in this part of the basin that have storage capacities of 20,000 acre-feet or more. They are owned and operated by USBR, IPC, and other organizations and have substantial influence on water resources, supplies, and the movement of surface and groundwater through the region. The total storage capacity of these reservoirs is more than 9.7 million acre-feet. In addition, there are numerous smaller Federal, state, local, and privately owned and operated dams and reservoirs throughout the Snake River basin.

The annual outflow of the Snake River averages about 2 million acre-feet at Milner, about 14 million acre-feet per year at Hells Canyon Dam (below Brownlee Dam), and about 36 million acre-feet just downstream of Lewiston, Idaho. Due to tributary inflow, diversions, interactions with underlying aquifers, and other hydrologic features, streamflow along the Snake River in any year varies over a large range. The average natural inflow to Brownlee Reservoir is estimated to be 20 million acre-feet (USBR 1999a) . (Natural inflow is the flow that would occur without the effect of storage development and diversion of water from the streams.)

There is also considerable variance of streamflow from year to year. During the 1928-1996 period, the annual streamflow at Heise (upper part of the basin) varied from a high of 7.3 million acre-feet in 1971 to a low of 3 million acre-feet in 1934. In the same period, the annual stream flow of the Snake River at Weiser (middle part of the basin) varied from 24.5 million acre-feet to about 7 million acre-feet. The variability of tributary streamflow is as great or greater; e.g., the annual streamflow of the Boise River has ranged from 3.5 million acre-feet to 0.83 million acre-feet. On average, the annual Snake River flow at Weiser is above 19 million acre-feet 10 percent of the time and above 8.1 million acre-feet 90 percent of the time.

The Snake River is highly developed, with estimated annual surface water diversions upstream from Brownlee Reservoir of 14.5 million acre-feet, primarily for irrigated agriculture. Due to losses from carriage systems and application of water at rates in excess of crop demands or soil water holding capacity, a large amount of diverted water returns to the stream to be diverted again and again. As a consequence, total diversions frequently exceed total natural flow. Although the total surface diversion is estimated at 14.5 million acre-feet, only about 7 million acre-feet are lost to the river through consumptive use. The remainder of this (7.5 million acre-feet) eventually returns to the river as surface or groundwater flow. Agricultural returns are a significant source of pollution to the middle Snake River (IDEQ 1997). Based on a 50-year simulation of current reservoir operations and water use patterns (USBR 1999a), consumptive use reduces annual inflow to Brownlee Reservoir by about 33 percent (20.4 million acre-feet reduced to 13.6 million acre-feet).

In addition to surface diversions, an estimated 7.5 million acre-feet of water are pumped from groundwater. Although return flows from groundwater withdrawals have not been estimated, very limited surface return flows would be expected because the cost of pumping does not warrant the application rates in excess of consumptive use and there is generally little or no conveyance loss. Because the Snake River plain aquifer discharges to the Snake River, principally in the form of springs downstream from Milner Dam, the likely effect of groundwater withdrawals from this aquifer is a reduction of inflow to Brownlee Reservoir.

Comparing simulated mean monthly discharges over a 50-year period with the projects in place and operating as proposed to the flows which would exist in the absence of water development in the basin (USBR 1988e), it can be clearly demonstrated that water development in the upper Snake River basin has substantially reduced streamflow at Brownlee Dam from April through August (Figure V-1). For example, during the months of May, June, and July simulated streamflows went from 63,000 cfs, 61,000 cfs, and 29,000 cfs, to 27,000 cfs, 23,000 cfs, and 14,000 cfs, respectively.

It should be noted that development includes water withdrawals for agriculture as well as

operations at storage projects not owned or operated by USBR. It therefore depicts not only the effects of USBR=s upper Snake River projects on mean monthly flow but includes the impacts caused by other storage projects and irrigation withdrawals. Of the 3,918,000 acres of irrigated agriculture in the Snake River basin, 1,585,257 acres, or about 40 percent, are served by USBR projects (USBR 1998a). Changing the operations of USBR=s projects alone could not transform the river=s hydrology to pre-development conditions.

The hydrologic impacts of water development on Snake River flows at Lower Granite Dam are somewhat attenuated by inflow from less developed tributaries, principally the Salmon and Clearwater Rivers (Figure V-2). Simulated mean annual flow is reduced by 17 percent at Lower Granite Dam as compared to 33 percent at Brownlee Dam. The greatest impact continues to be during the late spring and early summer. For example, simulated streamflows at Lower Granite Reservoir under natural flow conditions for the 50-year period averaged 159,000 cfs and 152,000 cfs in May and June respectively (USBR 1999a) while simulated flows for the same period under current conditions and operations (95 BiOp operations) averaged 108,000 cfs and 101,000 cfs. However, average streamflows in August were virtually identical (30,703 cfs under natural flow conditions and 31,314 cfs under current conditions) even though substantial irrigation withdrawals were included in the current operations scenario.

The basic effects of upstream reservoir operations on streamflow at Lower Granite Dam are: decreased streamflow during spring runoff while the reservoirs are refilling; variable reductions in summer discharge while the reservoirs are being drafted to increase streamflow which is offset by nearly identical depletions due to irrigation withdrawals, and modest changes (slight increases or decreases) from September through February.

VI. EFFECTS OF PROPOSED ACTION

Because the operation of these projects affects the quantity and timing of water (hydrograph), and water from these projects is used to meet seasonal flow objectives at Lower Granite and McNary Dams; NMFS has determined that the geographic scope, for the purposes of evaluating the effect of these operations on ESA listed Snake River salmon and steelhead, is best defined as the Snake River at Hells Canyon Dam downstream to the Columbia River plume and nearshore ocean environment.

It is important to understand the difference between spring and summer flow augmentation programs. Summer flow augmentation involves the release of stored water and acquired natural flow rights. Spring flow objectives are typically met without the use of any stored water. Spring flows are increased by shifting water that was previously used to generate electricity during the winter months into the spring flow augmentation period. These operations are described in greater detail in the following sections.

Spring Flow Augmentation

Spring flow augmentation is achieved by requiring key Federal reservoirs in the Columbia River basin to be at their flood control elevations in April. Previously, winter releases of water for power generation in some years resulted in reservoir elevations being lower than necessary for flood control purposes going into the spring runoff period. The net effect of holding these projects to their upper rule curves is to shift some water from winter augmentation for power generation back into the spring period. This shift of water is designed to benefit juvenile steelhead, sockeye, and spring/summer chinook which evolved to migrate during the leading edge and peak of the natural hydrograph.

In general, the proposed operation of USBR projects in the Snake River basin has little, if any, effect on spring flows in the Snake River downstream of Hells Canyon Dam compared to historical operations. The USBR will continue to maximize the probability of refilling its reservoirs for the upcoming irrigation season. Operating in this manner is roughly equivalent to holding a project with formal flood control requirements at its upper rule curve.

Summer Flow Augmentation

In contrast, stored water is routinely used to meet the summer flow objectives. Water is drafted from Snake River basin storage projects in July and August to augment flows, primarily to benefit juvenile fall chinook. The majority of these fish currently migrate in late June, July, and August as the natural hydrograph declines. The 427 kaf supplied by USBR in the Snake River basin increases the flow at Lower Granite Dam by an average of nearly 3 kcfs during the 72-day summer flow augmentation period. The release of this water, in conjunction with the release of 237 kaf from Brownlee Reservoir and 1,230 kaf from Dworshak Reservoir, increases the average summer flow at Lower Granite Dam by more than 13 kcfs. These releases are not static, but vary at TMT=s request to meet flow objectives and to provide other benefits to migrating fish. For example, TMT might request that the water be released in 36 days instead of 72 days. This would translate into twice as much augmentation flow (26 kcfs) at Lower Granite Dam, but for half the time (36 days).

A. Hydrologic Effects

A brief discussion of salmon flow augmentation operations is presented below. More detailed discussions are presented in the 95 and 98 BiOps.

1. Snake River Salmon Flow Augmentation

Most of USBR=s upper Snake River basin salmon flow augmentation program is accomplished by drafting water out of uncontracted space or by purchasing water from spaceholders through the Idaho Water Rental Pool and releasing it (Table III-2). A small amount of USBR=s salmon flow augmentation obligation (17,650 acre-feet) is provided from natural flow rights it holds in Oregon. Due to physical and institutional constraints it is not usually possible to deliver all of USBR=s salmon flow augmentation water during the 72-day summer outmigration period (June 22 through August 31). To satisfy its commitment, USBR has entered into an agreement with IPC to draft Brownlee Reservoir during the migration season with subsequent deliveries by USBR into Brownlee Reservoir. A separate agreement between IPC and BPA provides compensation in the form of electrical generation to IPC for losses incurred in providing timely delivery of USBR=s salmon flow augmentation water (IPC 1996).

In total, up to 1,894 kaf of water is shaped into the summer outmigration period. The 427 kaf delivered by USBR under its proposed action is one of three sources of augmentation water provided in the Snake River (Table VI-1). The others are Brownlee (237 kaf) and Dworshak (1,230 kaf) reservoirs. IPC provides a maximum of 237 kaf from Brownlee Reservoir by drafting Brownlee Reservoir from full (elevation 2,077 feet) down to elevation 2,059 feet, in accordance with requests by TMT. A contract between BPA and IPC (IPC 1996) reimburses IPC, in the form of electrical energy, for generation and head losses it incurs in providing these discharges. From Dworshak Reservoir, up to 1,230 kaf of water can be delivered during the summer by drafting 80 feet (elevation 1,600 feet at full pool to elevation 1,520 feet, the August draft limit).

In most years this salmon flow augmentation water would be provided principally during the 72-day period (June 21 through August 31) of the summer flow objective of 50 to 55 kcfs at Lower Granite Dam. The actual shaping of this water to provide maximum benefit to migrating salmon is an in-season decision using real-time information on base flow levels, water temperatures, and the status of the fish migrations. Table VI-2 illustrates the relative effect of each component of the Snake River salmon flow augmentation program.

Water passing through the Hells Canyon Complex typically exceeds 20E C (68E F - the upper incipient lethal temperature for salmonids) between late July and early September. Concern for the effect of high temperatures on juvenile migrants has led TMT to use water stored in Brownlee Reservoir as soon as possible in the summer, before it reaches critical temperatures. This reduces the need to draft Dworshak Dam early in the summer, allowing more of this cool water [9] to be saved for later use when water temperatures in the lower Snake River approach lethal limits for salmonids. Cold water releases can retard the growth of juvenile fall chinook rearing in the Clearwater River downstream from Dworshak Dam. Reducing early summer outflows from this project therefore also minimizes the potential adverse temperature effects on this portion of the Snake River fall chinook ESU.

Project	Shaped water volume in acre-feet	Shaped water volume in second-foot-days	Shaped water flow rate in cfs[1]
Upper Snake (USBR)	427,000	215,279	2,990
Hells Canyon Complex (IPC)	237,000	119,488	1,660
Dworshak (COE)	1,230,000	620,125	8,613
TOTAL	1,894,000	954,892	13,263

1 Assumes use at a constant rate over entire 72-day summer outmigration season (June 21 through August 31).

2. Columbia River Salmon Flow Augmentation

In some years Snake River salmon flow augmentation water may be also be used to help meet flow objectives at McNary Dam on the Columbia River. Therefore, for a complete understanding of the program, it is necessary to also consider the salmon flow augmentation program from upper Columbia River reservoirs.

Salmon flow augmentation on the Columbia River is provided from numerous sources, principally through winter drawdown limits. Winter discharges at Grand Coulee, Libby, Hungry Horse, and Albeni Falls dams are constrained to ensure the ability to operate within 0.5 foot of the upper rule curve by April 10, with the goal of achieving full pool at the end of June. [10] These rule curves have been established to preserve sufficient system-wide storage to prevent downstream flooding at all times. Upper rule curve reservoir elevations vary with runoff forecasts and date, with the highest storage available in the spring, when flood events are most likely.

[9] Dworshak Dam is equipped with a variable-intake-depth release structure that affords managers an opportunity to selectively withdraw cooler water at depth in the reservoir. Summer Dworshak Reservoir releases are generally discharged at temperatures ranging from 46E F to 52E F.

[10] TMT may request drafting below this level to benefit migrating fish as needed.

During the spring (April 10 through June 30) and summer (July 1 through August 31) certain upper Columbia River basin projects are operated to meet the flow objectives at McNary Dam (220 to 260 kcfs and 200 kcfs respectively). To enhance the ability to meet these flow objectives the following August 31 draft limits have been established: Grand Coulee - 1,280 feet, Libby - 2,439 feet, and Hungry Horse - 3,540 feet. When starting from full, drafting these reservoirs to the above draft limits provides over 2.1 Maf of stored water to benefit outmigrating salmon (Table VI-2). Shaping of this volume is an in-season management decision using the same process as described above for the Snake River salmon flow augmentation program.

Project	Shaped water volume in acre-feet	Shaped water volume in second-foot-days	Shaped water flow rate in cfs[1]
Grand Coulee (USBR)	791,000	398,796	6,432
Libby (COE)	892,000	449,717	7,253
Hungry Horse (USBR)	481,000	242,504	3,911
TOTAL	2,164,000	1,091,017	17,597

1 Assumes use at a constant rate over entire 62-day summer outmigration season (July 1 through August 31).

B. Factors Affecting Assured Delivery of Salmon Flow Augmentation Water

Although USBR has made headway in securing and committing uncontracted storage and natural flow rights to meet its obligation for 427 kaf of salmon flow augmentation water and has committed to using powerhead space in the event of a shortfall, it continues to rely on annual purchases from Idaho=s water rental pools for over half of the water delivered by its salmon flow augmentation program. Availability of water from Idaho=s water rental pools is highly variable (USBR 1998a) making this an insecure source of salmon flow augmentation water. The base flows which this program are intended to augment are also insecure and subject to further diminishment through ongoing water developments in the basin. Finally, there are a series of legal and institutional issues clouding the ability of this program to meet its objectives.

1. Concerns About the Surety of Water Supply for Salmon Flow Augmentation

a. Heavy Reliance on Rental Pool Water

Since the 1995 BiOp, USBR has acquired about 63,000 acre-feet of previously contracted storage space and about 18,000 acre-feet of natural flow rights. In all, USBR has been able to annually provide about 158,000 acre-feet of owned water to the salmon flow augmentation program annually (see Table III-3). The remainder (about 270 kaf) has been provided by annual rentals from Idaho=s water rental pools. The availability of rental pool water varies with prevailing hydrologic conditions, being most available when natural flows are high and least available when natural flows are low. Thus, in low flow years, when USBR=s salmon flow augmentation program could have the highest proportional effect on streamflow, water from Idaho=s water rental pools for the program would be least available.

b. Price Differentials and the Last to Fill Rule

Idaho=s water rental pools were primarily designed to permit annual water redistribution among agricultural interests within each water district. The districts employ two devices to protect in-district uses of rental pool water; a substantial price differential for water leased for out-of-district use, and the Alast to fill@ rule.

In the upper Snake River basin (Idaho Water District 1) and the Payette River basin (Idaho Water District 65) there are substantial price differentials between water delivered from the rental pools for uses within the originating district and deliveries for uses outside district boundaries (e.g. District 1 water sold for irrigation use above Milner Dam is priced at $2.95/acre-feet while water sold for non-irrigation uses below Milner Dam is priced at $10.50/acre-feet). Boise River basin water deliveries (Idaho Water District 63) do not have a similar price differential.

The Alast-to-fill@ rule requires that rental pool water sold for use outside the district is the last to fill the next spring. Thus, in a drier than average water year, storage space for water delivered from the rental pools for salmon flow augmentation would be the last to fill, both discouraging such use in any given year and potentially making such water less available in subsequent years. Under Idaho Code '42-1763B all water used for salmon flow augmentation must pass through the rental pools and is subject to rental pool rules, including USBR-owned water. The last to fill rule reduces the probability of USBR-owned space used in a given year for salmon flow augmentation being filled and available for salmon flow augmentation the next year, and may reduce the willingness of spaceholders to sell unused water to USBR for salmon flow augmentation.

This last to fill rule=s effect on a spaceholder=s willingness to sell unused water to the program is somewhat offset by the high price established for such use.

2. Potential Additional Water Supplies Through Modification of Reservoir Operations

a. Flood Control Regulation

Some USBR projects have formal flood control rule curves established in consultation with COE, often as part of a system of reservoirs operated for protection of farmland, engineered channels, and metropolitan areas located many miles downstream. Others have informal flood control rule curves developed by USBR, typically for nearby developments. Hydrosphere (1991) concluded that these rule curves are often highly conservative (overly protective) and that more careful management of the reservoirs could increase the likelihood of refill and the amount of water available for subsequent beneficial uses including salmon flow augmentation, without significantly reducing their flood control benefits. For example, by operating its projects in the Payette River basin to attenuate the flood of record (the highest flood ever recorded on the river) USBR evacuated 230,000 acre-feet more space in Cascade and Deadwood Reservoirs than would be required by flood forecasts driven by real-time hydrologic information in 1987 (Hydrosphere

1991).[11] If this water were not evacuated in the winter and spring in anticipation of the late spring flood, then the higher water levels in the reservoir would result in greater spring flows downstream from the reservoir and a higher probability and earlier date that the reservoir would refill. Both of these outcomes would benefit juvenile salmon during their outmigration. The effects of such changes in flood control operations would be greatest during dry to average years and lowest in wet years.

Several USBR reservoirs are managed to achieve specific winter flood control water level targets each year. To avoid impacting water users, drafting to reach these targets typically begins after October 15, the end of the irrigation season. If sufficient irrigation demand information were available to determine the volume of storage that would need to be drafted to meet these winter flood control target elevations, surplus flood storage (i.e. the likely storage volume at the end of the irrigation season minus the storage volume at the flood control target elevation) could be released earlier in the year to provide benefits to migrating salmon without injuring spaceholders. (Migrating juvenile salmon are often in the river system well after August 31 and would likely benefit from additional streamflow.)

b. Management of Uncontracted Space
The USBR holds almost 700,000 acre-feet of uncontracted storage space in its Snake River basin reservoirs (Hydrosphere 1991), mostly in its Cascade, Deadwood, and Lucky Peak projects (about 600 kaf). The vast majority of this storage space is committed to uses such as conservation pool maintenance, mitigation, reservoir evaporation, and streamflow maintenance (USBR 1998a) and has been used for irrigation during dry years (Hydrosphere 1991). Only about 158,000 acre-feet of this total is currently available for salmon flow augmentation. Uncontracted (USBR-owned) space is the most secure water available for salmon flow augmentation. Careful evaluation of existing uses of this space might identify potential additional supplies for this purpose.

c. Carryover Storage
Unused water held by spaceholders in USBR reservoirs can be Acarried over@ for delivery and use the next year. Carryover storage has the effect of increasing the likelihood of reservoir refill the following year, improving water surety for all spaceholders including water held by USBR for salmon flow augmentation. However, in some systems (e.g. Boise River basin) carryover water is often lost due to evacuation for flood control during the winter and spring.

Carryover storage is partially a reflection of water availability and, where applicable, demand for rental pool water. When water availability is high, much is consigned to the rental pools and much of that water may be carried over. When water availability is low, less is consigned to the

[11] The USBR has recently revised some of its flood control operations including these standard drafts (personal communication, Mr. Ron McKown, USBR, Boise, ID)

pools and less is carried over. Thus, like the rental pool water, carryover storage is highest when water is abundant and lowest when water is scarce.
In some years carryover storage is very large. For example, between 1982 and 1986 an average of about 67% of contracted space (2.5 Maf) was carried over in Water District 1 each year (Hydrosphere 1991). Carryover storage is therefore a potential source of substantial amounts of water for salmon flow augmentation but may not be available at the appropriate time to benefit outmigrating juvenile salmon.

3. Depletion of Base Flows
Depletion of the base flows to which salmon flow augmentation is added diminishes the net benefit of augmentation.

a. Water Spreading
Water spreading is the application of USBR project water to lands outside the boundary of the associated irrigation district. By irrigating additional acreage water spreading directly increases the consumption of project water, diminishing the water available for other users and purposes, including instream flows. The scale of water spreading at USBR=s projects covered by this Opinion is unknown. However, given that since 1995 sufficient water has been consigned to Idaho=s water rental pools to meet the needs of the salmon flow augmentation program, it appears that the scale of water spreading is sufficiently small that it does not adversely affect USBR=s ability to supply the current program needs.

b. Groundwater Recharge
Idaho is actively pursuing a program of groundwater recharge in which water would be diverted into various irrigation works in excess of crop demands and delivered to areas hydraulically connected to the Snake River Plain Aquifer in an attempt to minimize further groundwater level (water table) reductions and to increase the rate of discharge at various springs where the aquifer outcrops. This activity is being pursued to reduce the conflicts between senior water users and junior pumpers in the basin. By diverting water from the Snake River during the spring, this project could reduce streamflow during the juvenile salmon outmigration period.

c. Expanding Water Development in the Snake and Columbia Basins
Large-scale water development within the Snake and Columbia basins could reduce streamflows during the juvenile salmon outmigration season. The NMFS has established a policy of no net loss of streamflow during the juvenile salmon outmigration season when seasonal flow objectives are not being met. This policy is currently being applied to all new water developments in the Columbia River basin where Federal actions are required.

4. Legal and Institutional Constraints on the Salmon Flow Augmentation Program
a. Water Right Transfers
The principal mechanism for increasing the surety that sufficient salmon flow augmentation water can be delivered is acquisition of existing water rights or spaceholder contracts and conversion to instream flows. Water right transfers are often difficult and conversion of diversion-based water rights to instream flows are particularly troublesome. There are an array

of Federal, state, and local irrigation district laws and regulations regarding the transfer of water rights that limit USBR=s ability to acquire and devote additional reservoir space and natural flow rights to salmon flow augmentation.

Federal laws governing uses of water from USBR projects can limit use to specific purposes within specific project boundaries. However, USBR has adopted policies that defer to the states decisions regarding water right transfers involving storage rights in USBR projects (DOI 1988). The USBR only involves itself in such transfers to protect existing uses of project water, other project purposes, and repayment feasibility. In adopting the 1995 BiOp=s salmon flow augmentation program in its Record of Decision, USBR (1995) stated that it Awill provide water for flow augmentation in compliance with state water right administration.@

Under Idaho law, water right transfers are reviewed or tested by IDWR to ensure that other water right holders are not injured, the transfer does not expand the use under the right, and the transfer is in the local public interest.

In transferring natural flow water rights to the salmon flow augmentation program the most difficult of these tests is demonstrating that the transfer would not result in injury to other water right holders, including junior water rights. Satisfying this requirement means that only that portion of the water right consumptively used can be transferred. This restriction ensures that return flows from the exercise of the right at its original point of diversion or place of use continue to be available to other users dependent on such flows. It is not uncommon for transfers involving a change in use or point of diversion to result in 40 percent or less of the water right amount being transferable.

Also, water right transfers in excess of 50 cfs or 5,000 acre-feet within Idaho require legislative approval. Such approval would likely be difficult and time consuming to obtain.

In Idaho, the majority of irrigation districts do not allow individual landowners to transfer water either outside or within district boundaries (Hydrosphere 1991). [12]

Only the Idaho Water Resource Board is authorized to hold instream flow water rights in Idaho. Because instream flow water rights can only be obtained for unappropriated water, it is not currently possible to acquire natural flow water rights and convert them to instream flows.

Acquisition and conversion to instream flows is allowed in Oregon but very little water is potentially available from this source.

[12] Irrigation districts are quasi-governmental bodies formed to deliver water to water users within the district boundaries from owned natural flow water rights or spaceholder contracts in USBR reservoirs.

Due to these complications in acquiring and transferring natural flow water rights to instream flows, the reacquisition of spaceholder contracts in USBR reservoirs holds more promise for improving the salmon flow augmentation program. Such acquisitions are covered by state and irrigation district regulations but the potential for third-party injury is substantially reduced.

b. Water Conservation

Water conservation has often been touted as a potential solution to low streamflow conditions. The issue is not as simple as maximizing water use efficiency such that the amount of water diverted approximates total crop consumption. First, it is often necessary to divert excess water to maintain ditch water levels sufficient to deliver water to individual users at appropriate rates. Also, not all water diverted in excess of crop consumption is lost to the stream. Although frequently diminished in quality, much of the excess diversion returns to the stream at a different point and time. For example, much of the excess diversion in the upper Snake River basin percolates to the Snake River plain aquifer and provides source water for pumped groundwater irrigation or augments springs and seeps in the Thousand Springs area.

The use of sprinkler irrigation has increased dramatically in recent years. Sprinkler systems provide a number of benefits including using less water than flood irrigation practices. Other practices such as ditch lining and automatic gate controls allow less water to be diverted while meeting crop demands. The amount of water that could be saved through adoption of these practices represents a potentially important source of water to augment flows in the Snake River for anadromous fish.

Under section 201(a) of the 1982 Reclamation Reform Act, USBR has developed a Water Conservation Field Services Program. Under this program, USBR provides: water conservation planning assistance, water conservation measure implementation, water conservation demonstrations, water conservation education and training, and fosters opportunities for partnerships and public input. Among the important conservation measures implemented under this program are improved water measurement, automated headgate controls, and conveyance system improvements. These measures allow water users to accurately track water use to facilitate balancing water use to crop demands, and to reduce conveyance losses.

Although it may be possible to reduce the amounts of water diverted for irrigation and lost to instream flows without reducing crop production, there is little incentive for irrigators to decrease diversion rates because the diverted water, up to the amount of the associated water right, is essentially a free good. Under the prior appropriations doctrine conserved water simply returns to the waterway for the beneficial use of other downstream users. The water right holder has no claim to this Aconserved@ water.

This traditional Ause it or lose it@ concept of the prior appropriations doctrine has been somewhat modified by the development of water rental pools in Idaho. A water rental pool has been in existence in the upper Snake River basin since the 1930s to facilitate temporary water transfers among storage water spaceholders (BPA 1992). With the reduction in diversion rates associated with increased reliance on sprinkler irrigation systems, the amount of water in the rental pool grew. As the amount of water in the rental pool grew so did concerns among the participants that

the unused stored water consigned to the pool might be considered abandoned and subject to appropriation by others. In 1979, this led the Idaho legislature to formally establish rental pools and to proclaim that water consigned to the pools was not subject to abandonment claims. (Idaho Code ' 42-1761-64).
It is therefore notable that Idaho has created a marketplace for conserved storage water through establishment of the rental pools. The primary purpose of these rental pools is to facilitate transfers among irrigators. However, as noted above, these pools account for over half the water delivered under USBR=s salmon flow augmentation program and USBR is currently the largest purchaser of water from Idaho=s rental pools.

There currently is not a similar mechanism to transfer conserved natural flow water into instream flows in the state of Idaho.

c. Salmon Flow Augmentation as a Beneficial Use
Under the prior appropriations doctrine of water use allocation, water rights can only be held for specified beneficial uses. As originally constituted, Idaho law recognized only hydropower as a non-consumptive beneficial use. In the 1970s, Idaho=s State Water Plan established a variety of non-consumptive beneficial uses of water including fish and wildlife habitat (Policy 1C). It also established preservation and enhancement of Idaho=s anadromous fishery resources as a state policy (Policy 2C).

In 1978 the Idaho Legislature enacted the minimum streamflow statute, which states that the Idaho Water Resource Board (IWRB), a policy-making body, may apply to IDWR for a permit and license establishing a right for minimum streamflow or lake level. Such applications are limited to unappropriated waters at the time of application and would thus be junior to all other users in the basin. It is questionable as to whether a valid appropriative right for other uses such as irrigation can be changed for use as an instream flow water right. To date no such conversions have been allowed. Only the IWRB may hold an instream flow water right in Idaho.

The statute specifies that the amount approved for this use must be found to be the Aminimum flow or lake level, and not the ideal or most desirable@ flow or level.

As discussed previously in this document (Section III.A.2.) the Idaho Legislature has enacted legislation which allows up to 427,000 acre-feet of water to be delivered for salmon flow augmentation under the protection of IDWR. This statute expires on January 1, 2000.

d. Milner Agreement
In 1996 USBR, IPC, and USFWS entered into an agreement to facilitate the delivery of salmon flow augmentation water from the upper Snake River. This agreement, which expires after 1999, limits the release of water for salmon flow augmentation to 1,500 cfs at Milner Dam. This limit improves the program=s power generation benefit at IPC powerplants, and prolongs water quality and resident fish and wildlife (including ESA-listed Snake River snails) benefits downstream from Milner Dam. However, it often results in a portion of the salmon flow augmentation water from the upper basin being delivered to the lower Snake River after the flow augmentation period

ends in August. In return for USBR limiting flows to 1,500 cfs at Milner, IPC has agreed to pre-deliver that portion of the water which does not reach the lower Snake River during the salmon flow augmentation period. This agreement also stipulates an operation to "ramp down" these flows at the end of the augmentation program to prevent stranding ESA listed snails in the middle Snake River.

Based on the outcomes of 1996 through 1998 operations under the Milner Agreement, IPC has successfully delivered the required volume of salmon flow augmentation water to the lower Snake River during the augmentation period, including pre-delivery of a portion of USBR=s contribution. After 1999, a new agreement between USBR, USFWS, NMFS, IPC, and the State of Idaho will be necessary to assure timely delivery of USBR=s salmon flow augmentation water.

C. Species= Response to the Proposed Action

1. Spring Migrants

The USBR=s operations in the Snake River basin significantly reduce the spring runoff at Brownlee and Lower Granite Dam (Figures V-1 and V-2). Reducing spring flows impacts salmon and steelhead that evolved to migrate during the spring freshet and can also affect the Columbia River estuary and near-shore ocean environment. These impacts affect all spring migrating salmon (juvenile spring/summer chinook, sockeye, and steelhead and adult spring chinook and steelhead (see section IV). The 1995 BiOp limited winter drafts at several Columbia River storage projects to those necessary for flood control to minimize the impact of Columbia River basin storage facilities on the spring freshet. The USBR=s Snake River basin projects are operated to maximize their chance of refilling prior to the summer irrigation period (see Section VI.A.) except as necessary to meet flood control requirements. This operation is similar in effect to the winter draft limits specified by the 1995 BiOp for other storage facilities in the Columbia River basin.

Furthermore, the 1995 BiOp recognized that summer flow objectives are more difficult to achieve than spring flow objectives at both Lower Granite Dam and McNary Dam[13]. For this reason, refilling projects by June 30 to provide water for summer flow augmentation is a priority. The USBR=s salmon flow augmentation water is released as part of this effort to meet summer flow objectives in the Snake and Columbia Rivers. Therefore, the remainder of this analysis will focus on the effect of USBR=s proposed action on species migrating during the summer flow augmentation period (juvenile summer/fall chinook and adult summer/fall chinook, sockeye, and steelhead - see section IV).

[13] Although spring flow objectives are more likely to be met, they are not met in all years. Additional opportunities for improving spring flow conditions appear to exist at USBR projects in the Snake River basin upstream of Brownlee Dam and should be evaluated (see Section VI.B.).

2. Summer Migrants

Ideally, an action=s effectiveness in stabilizing a population would be measured as a change in that population=s ability to replace itself over time. For example, in a perfectly stable salmon population, one adult female would need to return for each female that spawned in the preceding generation. Unfortunately, environmental fluctuations and human activities make it extremely difficult to establish a simple, direct correlation between a particular action and its effect, as measured by the number of returning adults. Trends in the number of returning adults over time can be viewed as evidence of a population=s ability to persist under the suite of factors affecting all phases of its life-history but cannot be attributed to any single measure.

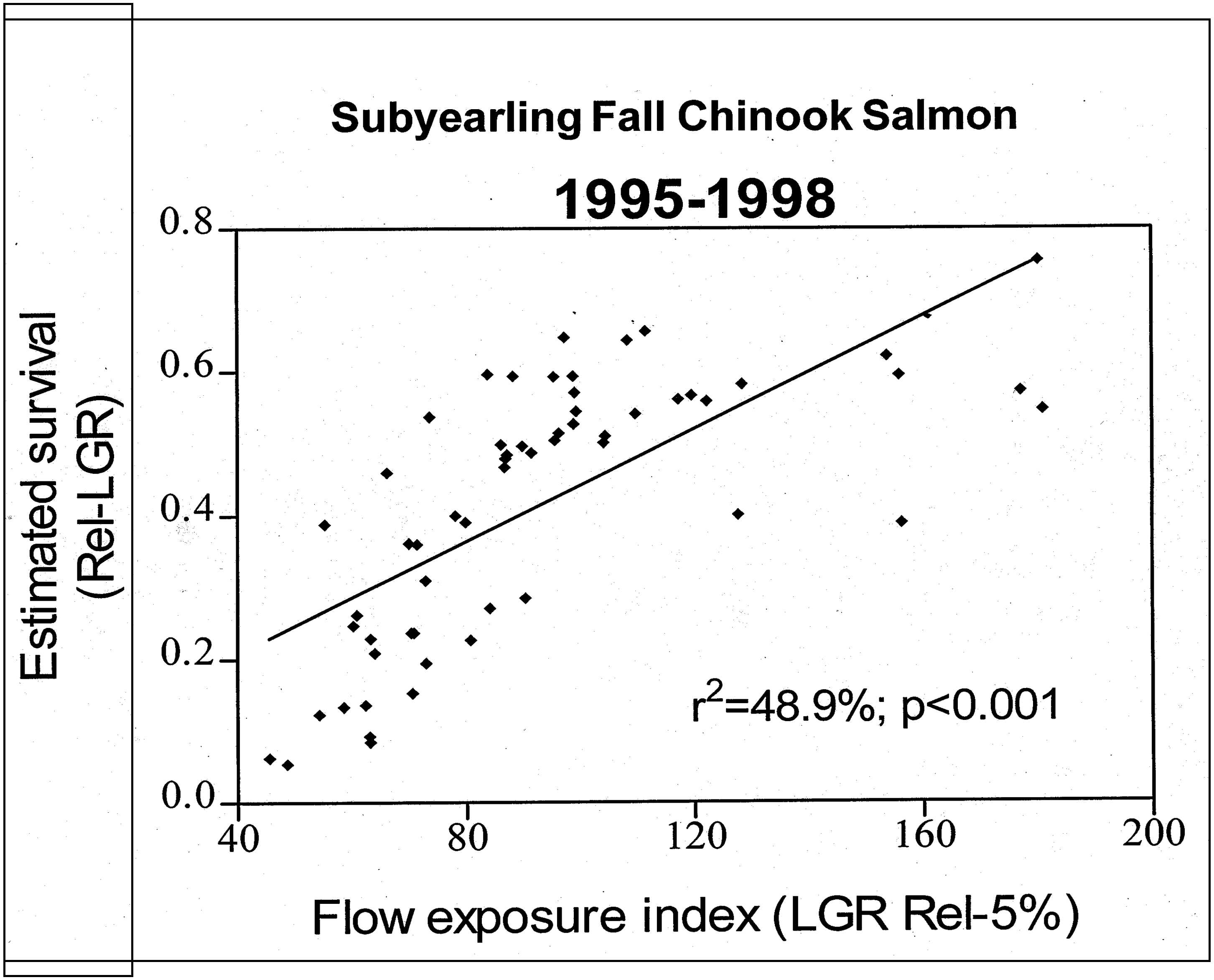
a. Adult Fall Chinook

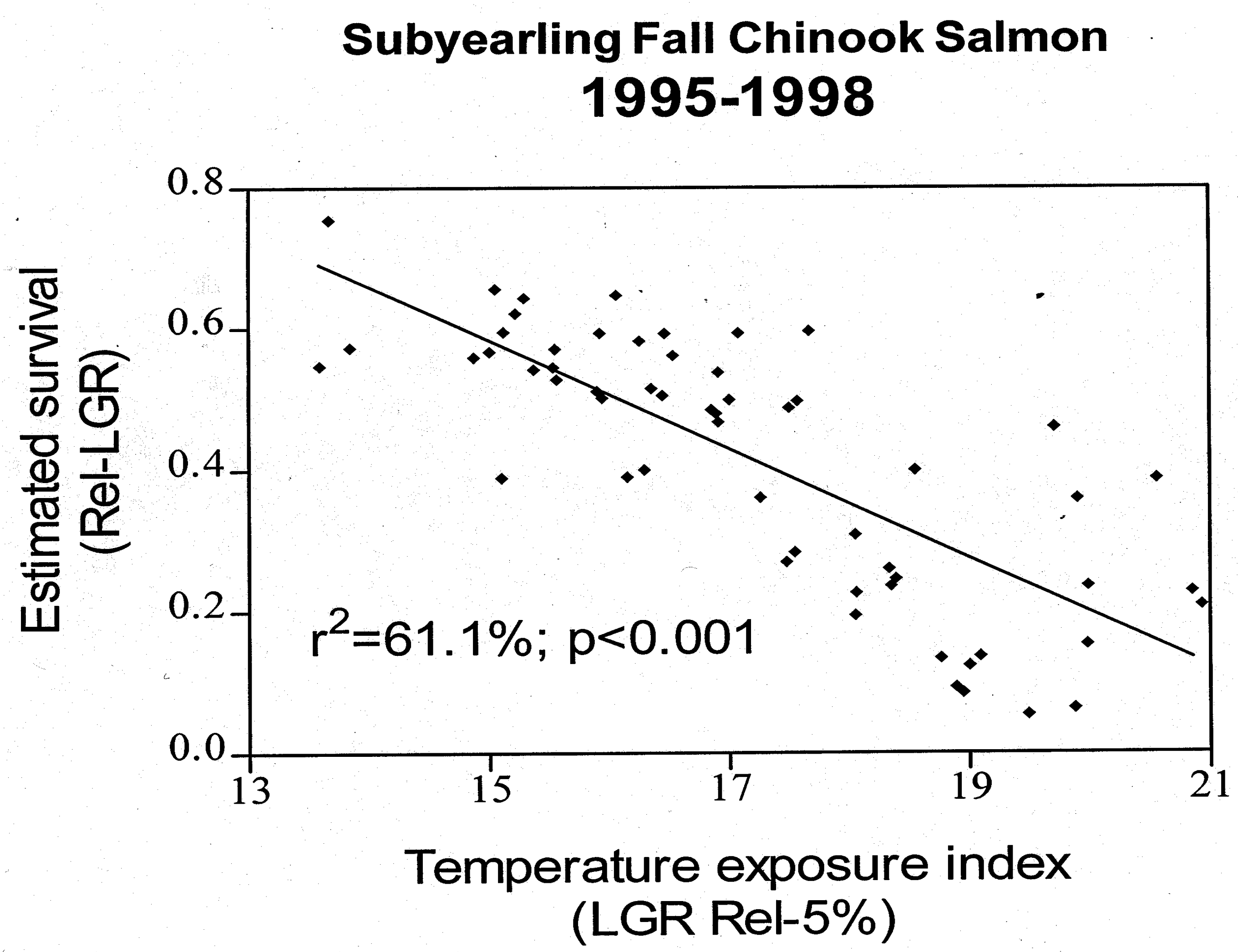
The number of naturally produced fall chinook adults returning to Lower Granite Dam has increased in recent years (Figure VI-1). The average number of naturally produced adults returning to Lower Granite Dam each year from 1985 to 1990 was 360 fish. From 1991 to 1995, the average number of returning adults was 473 fish. Since the 1993-1994 juvenile outmigrations, when USBR=s flow augmentation program was fully implemented, an average of 580 naturally produced adults have returned to Lower Granite Dam (1996-1998). It is difficult to establish a causative relationship between a single component (e.g. 427 kaf of flow augmentation water) of a large suite of measures (1995 and 1998 BiOp RPA measures) and adult returns. Changing environmental factors such as air and water temperatures, precipitation patterns, and ocean conditions; as well as changing human activities like dam operations, hatchery practices, and harvest practices all act as confounding variables in scientific evaluations of adult returns. However, the recent trend exhibited by fall chinook salmon provides encouragement that survival over their entire life cycle is improving.

b. Juvenile Fall Chinook

The NMFS Science Center has used Passive Integrated Transponder (PIT) tags to study migrating juvenile steelhead and spring/summer and fall chinook in the lower Snake River. This effort is aimed at understanding the complex interactions between these fish, as measured by travel times or survival, and key environmental variables they encounter during their migration. These studies use hatchery fish release groups as surrogates for migrating wild fish. The NMFS presented preliminary results for 1998 to the Implementation Team meeting on October 1, 1998 (Smith 1998).

Survival of PIT-tagged juvenile hatchery fall chinook from release points in the Snake and Clearwater Rivers to Lower Granite Dam from 1995 to 1998 indicate there is a strong, positive correlation between flow indices and survival (Smith 1998). This pattern is consistent both within and between years (Figure VI-1). Survival is also highly correlated with water temperature (Figure VI-2) and turbidity indices for PIT-tag release groups. This study suggests that increasing flows, increasing turbidity, and decreasing temperatures can significantly improve the survival rates of fall chinook smolts between their point of release in the free flowing Snake River and Lower Granite Dam. Determining the relative contributions of these factors will require further study.


Subyearling Fall Chinook Salmon
1995-1998
Estimated survival
(Rel-LGR)
0.0
0.2
0.4
0.6
0.8
40
80
120
160
200
r2=48.9%; p<0.001
Flow exposure index (LGR Rel-5%)



Subyearling Fall Chinook Salmon
1995-1998
Estimated survival
(Rel-LGR)
0.0
0.2
0.4
0.6
0.8
13
15
17
19
21
r²=61.1%; p<0.001
Temperature exposure index
(LGR Rel-5%)

A similar study of juvenile fall chinook was conducted by the U.S. Fish and Wildlife Service and the Idaho Department of Fish and Game between 1992 and 1995 (Connor et al. 1998). In this study subyearling chinook smolts were seined in the Snake River upstream of Lower Granite Reservoir, PIT-tagged, and then released back into the river. The study found strong correlations between the detection rate of these fish at Lower Granite Dam and mean summer flow (R^2 = 0.993) and maximum summer water temperatures (R^2 = 0.984). The authors concluded that their findings Asupport summer flow augmentation as a beneficial interim recovery measure for enhancing survival of subyearling chinook salmon in the Snake River.@ **c. Adult Steelhead, Sockeye, and Spring/Summer Chinook**

Adults of all ESA listed Snake River stocks migrate upstream through the FCRPS and the Snake River upstream of Lower Granite Reservoir during the summer flow augmentation period. Additionally, salmon and steelhead, both listed and proposed for listing under the ESA, migrate through the lower Columbia River downstream of its confluence with the Snake River. Because the Columbia River provides the majority of the flow during the summer migration period downstream from its confluence with the Snake river, we expect that any beneficial or negative effects of USBR=s operations will be greater for Snake River stocks than for listed species from elsewhere in the Columbia River basin.

Radio-tracking studies are ongoing and comprehensive results from these studies should become available in 1999. Preliminary results indicate that the range of flows experienced during the summer do not adversely affect the ability of adults to migrate upstream through the FCRPS or the free flowing river above Lower Granite Dam (personal communication, Ted Bjornn, Professor, University of Idaho, January 20, 1999). The benefits of summer flow augmentation for adult salmon and steelhead has not yet been fully evaluated.

VII. CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this Biological Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Endangered Species Act.

A. Non-Federal Irrigation

There are about 4 million acres of irrigated agriculture upstream of Lower Granite Dam (BPA 1993). The USBR supplies water to about 40 percent of this total. Much of the remaining 2.5 million privately irrigated acres are served by groundwater pumping. However, due to the connection between groundwater levels and streamflow in much of the Snake River basin, these withdrawals also affect streamflow downstream from Hells Canyon Dam. Water development (both surface water and groundwater) has reduced the mean annual flow at Lower Granite Dam by about 17 percent (USBR 1999a).

Recent surveys show that the number of acres under irrigation is declining slightly in Idaho. In 1992, 3,260,000 acres were estimated to be under irrigation (U.S. Census of Agriculture [last available is 1992], in USBR 1998a). This represents a decrease of about 215,000 (6.2 percent) from the peak which occurred in 1978. During the same period, the amount of land receiving either full or supplemental service from USBR projects decreased by only 26,000 acres (from 1,607,000 acres to 1,581,000 acres), or 1.6 percent. Based on these data, it appears that the number of irrigated acres in Idaho has stabilized and may be declining slightly. If this current trend continues, substantial further reduction in streamflow downstream from Hells Canyon Dam due to agricultural withdrawals appears unlikely.

B. Population Growth

Between 1990 and 1996, the population of Idaho increased by 18.1 percent to 1,189,000 people (USBR 1998a). This growth is expected to continue. The increasing population will place greater demands on the Snake River and its tributaries for electricity and water for municipal and industrial purposes. Increasing population in southern Idaho would likely affect water quality both directly, (sewage and pollutants), and indirectly (urbanization and loss of riparian functions). Urbanization also decreases per acre water usage. Potential effects of Idaho=s rapid population growth on the Snake River downstream of Hells Canyon Dam include slightly increased flows and slightly decreased water quality.

C. Aquifer Recharge Program

Intensive groundwater development of the Eastern Snake River Plain Aquifer since the 1940s has increasingly caused conflicts with senior water right holders in Idaho. Agricultural groundwater pumping has caused the groundwater level to drop over 20 feet in some areas and has reduced the flow of springs for which senior surface water rights exist. Several senior water right holders have filed claims against junior groundwater pumpers (Rosholt, Robertson, and Tucker 1997). To resolve these conflicts IDWR has initiated several studies and promulgated new rules to deal with conflicts in conjunctive (surface and groundwater) use. One potential mitigation measure identified by IDWR is aquifer recharge. Initiated as a managed recharge study in 1997, IDWR has recently filed for water rights totaling almost 15,000 cfs to facilitate the project should it prove feasible. Although it is unlikely that diversion rates near this total would be possible or even desired, an aggressive program of aquifer recharge has the potential to affect the quantity and timing of discharge downstream from Hells Canyon Dam.

8. CONCLUSION

New information further supports the biological basis of the already-established flow objectives for fall chinook salmon. Specifically, recent PIT-tag survival studies indicate there is a strong, consistent relationship between flow, temperature, turbidity and the survival rates of juvenile hatchery fall chinook from points of release to Lower Granite Dam both within and between years.

Timely provision of 427 kaf of water from USBR projects in the upper Snake River basin to help meet the established flow objectives in the Snake River and Columbia Rivers was one of the immediate actions identified in the 1995 and 1998 Biological Opinions that, together with other actions to improve survival of listed fish stocks, were determined to be adequate to avoid jeopardizing the continued existence of listed species. In this Biological Opinion we evaluated the adequacy of measures employed by USBR to facilitate delivery of 427 kaf of water for salmon flow augmentation (Sections III and VI). We determined that USBR has been able to consistently deliver sufficient water to meet its obligation for salmon flow augmentation (Table III-2) and proposes taking water from its powerhead space to meet this objective in the event of a future water shortage. Despite these measures and the apparent success to date, the hydrologic variability in the basin is such that USBR may be unable to provide 427 kaf of salmon flow augmentation water under some low flow conditions (USBR 1998a).

We have also identified a number of factors affecting the surety that sufficient salmon flow augmentation water can be delivered (Section VI. B). These factors create concerns for NMFS both for current USBR operations under the 1995 and 1998 BiOps and for the potential effectiveness of any alternative salmon flow augmentation program that might be considered as part of a long-term decision. Given: the lack of surety of supplies currently involved in USBR=s salmon flow augmentation program; the potential for additional and/or more secure supplies of augmentation water through modification of reservoir management; and the legal and institutional constraints on water delivery and the acquisition and transfer of water rights to salmon flow augmentation, USBR should undertake thorough evaluation of these and other issues that may affect its ability to provide greater surety and more water to its salmon flow augmentation program prior to reinitiating consultation.

Notwithstanding these concerns about physical, legal, and institutional constraints, NMFS has determined that USBR=s proposed action for its upper Snake River projects is consistent with the operations envisioned in the 1995 and 1998 FCRPS Biological Opinions. The USBR is providing 427 kaf of water from its storage facilities and from willing sellers in accordance with applicable state water law. This water is shaped by Brownlee Reservoir at the request of the Technical Management Team to improve summer flows for juvenile fall chinook migrating through the Snake and Columbia Rivers.

Further, USBR=s active involvement in the Snake River Resources Review, completion of the 1 Maf Analysis (USBR 1999b), and ongoing efforts to secure sufficient water to provide 427 kaf of salmon flow augmentation, indicate that USBR is fulfilling its obligations to protect listed fish in the interim and to develop the information needed for the long-term FCRPS configuration decision.

The NMFS has determined that, based on the available information, the continued operation and maintenance of USBR=s projects in the Snake River basin upstream of Brownlee Dam, as described in Section III, is not likely to jeopardize the continued existence of listed Snake River steelhead, sockeye, spring/summer chinook, or fall chinook; or result in the destruction or adverse modification of their critical habitat. Based on the similarity of effects of USBR=s Snake River operations on other listed and proposed anadromous fish in the rest of the Columbia basin, NMFS also determines that the continued operation and maintenance of USBR=s projects in the Snake River basin upstream of Brownlee Dam, is not likely to jeopardize the continued existence of listed steelhead, chinook, and chum ESU=s in the rest of the Columbia River basin, or result in the destruction or adverse modification of their critical habitat.

IX. INCIDENTAL TAKE STATEMENT

This incidental take statement supplements the 1995 and 1998 Biological Opinions concerning the FCRPS and therefore incorporates by reference their Incidental Take Statements. In the course of this supplemental consultation NMFS has identified an additional reasonable and prudent measure to further minimize the impact of the incidental take authorized by those opinions. Without altering the amount of incidental take previously authorized, the additional measure and its associated terms and conditions are as follows:

A. Reasonable and Prudent Measure

1. Because USBR=s salmon flow augmentation program is heavily dependent on annual water rentals from Idaho=s water rental pools, a variable and insecure source, USBR shall not issue any new contracts to storage space or otherwise commit any uncontracted storage space provided by the projects covered by this Biological Opinion without further consultation.

B. Term and Condition

In order to be exempt from the prohibitions of section 9 of the ESA, USBR must comply with the following term and condition, which implements the reasonable and prudent measure described above. This term and condition is non-discretionary.

1. Prior to entering into any agreement to commit uncontracted storage space in any of its reservoirs covered by this Biological Opinion to any use other than salmon flow augmentation USBR shall consult with NMFS under section 7(a)(2) of the ESA. Such consultations shall identify the amount of discretionary storage being sought, the current probability of such storage being available for salmon flow augmentation, and any plan to replace the storage volume currently available to salmon flow augmentation that would be lost as a result of the proposed commitment. The NMFS criteria in conducting such a review is to ensure that there be Azero net impact@ from any such USBR commitment on the ability to meet the seasonal flow objectives established in the 1995 BiOp (letter from William W. Stelle, Jr., NMFS Regional Administrator, to Brg. General Robert H. Griffin, COE Division Commander, May 16, 1997). Replacement supplies should have at least an equal probability of being available for salmon flow augmentation as the storage space that is being committed.

X. CONSERVATION RECOMMENDATIONS

Section 7 (a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Conservation recommendations are discretionary measures suggested to minimize or avoid adverse effects of a proposed action on listed species, to minimize or avoid adverse modification of critical habitat, or to develop additional information. The NMFS believes the following conservation recommendations are consistent with these obligations, and therefore should be implemented by USBR. These recommendations are primarily for documenting and providing the information that will be needed to quantify system opportunities, capabilities, and constraints to improving flow and water quality to conserve listed species in the Snake River. The NMFS expects to examine the results to these evaluations in conducting future consultations.

A. The USBR should continue its efforts to improve the volume and quality of water it is able to deliver for salmon flow augmentation downstream from Hells Canyon Dam and the surety that 427 kaf of water can be delivered to augment natural flows in the Snake River during the juvenile salmon outmigration period. To the extent that the measures listed below could affect the property interests, authorities, and responsibilities of other interested parties, USBR should consult with them on the development and implementation of any measure to improve the surety of supply of water for salmon flow augmentation.

1. The USBR should identify and pursue opportunities to buy back spaceholder contracts at all projects covered by this Biological Opinion.
2. The USBR should identify and pursue potential modifications of reservoir operations that would provide greater volumes or surety of salmon flow augmentation water including:
   a. potential modification of flood control regulation at its reservoirs. Lower drafts for flood control would provide additional flow during the spring and could improve the probability of reservoir refill, a potential benefit to all water users.
   b. earlier evacuation of flood control storage. The USBR should continue to evaluate options for evacuating flood control storage during the latter stages of the salmon outmigration season (August and September).
   c. potential redistribution of uncontracted storage space to benefit salmon flow augmentation. The vast majority of USBR=s uncontracted storage space is currently obligated to other uses such as conservation pools rather than salmon flow augmentation. The USBR should request assistance from USFWS, the Idaho Department of Fish Game, and other appropriate agencies in evaluating the justifications and need for existing conservation pools.

B. The USBR should continue working with Federal, state, and private entities to develop and evaluate operations that would benefit ESA listed species. Specifically:

1. The USBR should continue its efforts, through the Snake River Resources Review (SR^3) process, to develop a decision support system aimed at improving USBR=s ability to make sound, broadly-based resource decisions.
2. The USBR should reevaluate the Milner Agreement=s 1,500 cfs maximum discharge rate at Milner Dam in light of new information being developed through other processes. The NMFS anticipates that studies being completed by Idaho Power Company in their ongoing relicensing effort and the implementation of IDEQ=s Middle Snake River Water Management Plan (IDEQ 1997) will add significantly to our understanding of the biological and ecological processes in this reach of the Snake River. The USBR=s efforts should incorporate the results of these other processes. Following this evaluation USBR should make alternative recommendations to NMFS, as well as all interested Federal, state, and private organizations.
3. The USBR should evaluate the impact of its policy of following the Idaho Water Rental Pool Alast to fill@ rule, especially its application to uncontracted (USBR-owned) water. This rule likely reduces the willingness of potential sellers of stored water to contract that water to out of district uses such as salmon flow augmentation and diminishes the surety of USBR-owned water used for this purpose.
4. The USBR should evaluate the impacts of water withdrawals in excess of established water rights or spaceholder contracts and water spreading (use on lands outside of irrigation district boundaries), and seek opportunities to reduce these uses, in all irrigation districts benefitting from USBR=s storage projects covered by this Biological Opinion. Excess water withdrawals and water spreading can reduce the base flow to which the USBR augmentation water is added, diminishing its potential benefits to salmon.

C. The USBR should continue to work with IDWR to prevent:
1. Water delivery to spaceholders in amounts in excess of the spaceholder contracts held by each spaceholder for each project,
2. Water delivery in excess of state-authorized water rights held by individuals and entities served by each project, and
3. Water use at rates in excess of that needed to reasonably support the beneficial use to which it is applied (wasteful).

D. The USBR should continue to evaluate opportunities to assist water users throughout the region to manage their water more effectively, including but not limited to: improving water measurement, accurate water accounting, minimizing conveyance losses, and minimizing environmental impacts to instream and other watershed resources.

E. The USBR should continue to work with IPC, IDWR, and the watermasters to provide an annual accounting of the water delivered to Brownlee Reservoir, including:
1. A brief introduction or summary describing:
- the quantity of water released by USBR for salmon flow augmentation,
- the quantity of water delivered to the Snake River by USBR from the Oregon natural flow program,

- the quantity of natural streamflow diverted upstream of Brownlee Reservoir not specifically authorized by state water rights,
- the quantity of salmon flow augmentation water delivered downstream from Hells Canyon Dam during the salmon out-migration period (April 3 through August 31), and
- any difficulties encountered in making releases or achieving timely delivery of the salmon flow augmentation water.
- the quantity of flood control water evacuated between August 1 and October 15.

2. A detailed description of salmon flow augmentation deliveries for each basin (Upper Snake, Payette, Boise, and Oregon natural flows) including:
- a breakdown for each project in the basin describing the quantities delivered from uncontracted space, power head space, rental pool, or natural flow right,
- a description of the timing of releases from each basin; and
- a description of how water was shaped by Idaho Power Company from out-of-season USBR releases into the salmon outmigration season.

3. Detailed description of how actual operations conform with the Salmon Flow Augmentation Plan including:
- the cause(s) of any deviations from the plan and
- any remedial actions USBR proposes to undertake to avoid or minimize such deviations in the future.

The USBR should diligently pursue each of these measures and should be able to demonstrate progress and an understanding of the likelihood that the underlying issues can be resolved prior to the 1999 Decision. In order to be kept informed, NMFS requests that USBR provide an annual status report on its implementation of each of these conservation recommendations.

XI. REINITIATION OF CONSULTATION

The NMFS anticipates that USBR will reinitiate consultation on the operation and maintenance of their projects in the Snake River basin upstream of Lower Granite Reservoir in conjunction with a regional decision regarding the long-term configuration of the FCRPS. This consultation is therefore in effect through the interim period described in the 1995 FCRPS BiOp. The NMFS expects that a regional recommendation will be made in 2000, however, USBR should anticipate providing 427 kaf of salmon flow augmentation water for the foreseeable future and is obligated to take all necessary measure to preserve its ability to do so.

This concludes formal consultation on the actions outlined in USBR=s biological assessment. As provided in 50 CFR '402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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